DEC 16 1914

# THE HEATING AND VENTILATING MAGAZINE

Vol. XI. No. 12
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NEW YORK, DECEMBER, 1914.

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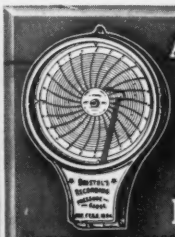

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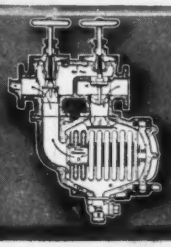

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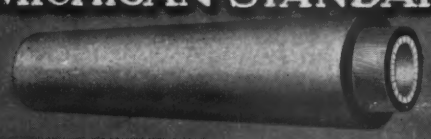

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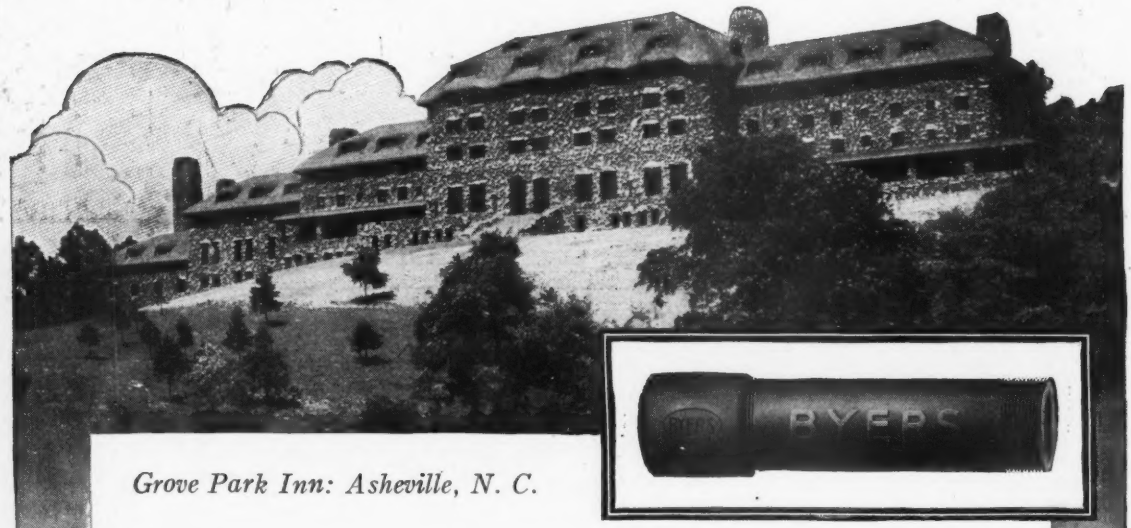


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FULL WEIGHT GUARANTEED

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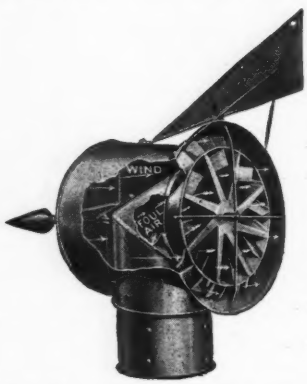


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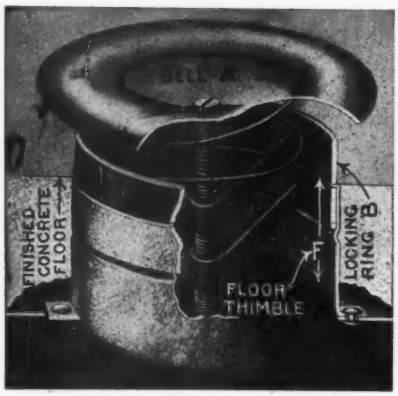


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Note projection of cap which deflects the air towards the floor, thereby eliminating draughts. Compare with other caps

THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK DECEMBER, 1914

# *Systems for the Engineer and Contractor*

PRACTICAL SUGGESTIONS, WITH FORMS, FOR INCREASING BUSINESS EFFICIENCY.

BY THOMAS BARWICK, C. E.

*(Continued from November issue.)*

All mechanics have a certain pride in their work. It is born in them and, with proper supervision, such mechanics will do almost anything within reason, but with slave-driving methods they cannot be induced to do their best work. This does not mean that they will shirk or waste time from pure spitefulness, but in many cases they will waste time or shirk from improper direction and application.

Many installations are poorly laid out so that the plans are often almost meaningless. In such cases, the workman is expected to solve the problem for himself and, in doing so, he has to make frequent sketches to overcome certain conditions. In many cases these are unnecessary if the plans are well laid out in the first place. The writer has seen plans sent out on jobs that could not possibly be followed, the piping being arranged, for instance, so that it ran through stairways and in other impossible places.

There is also considerable judgment to be exercised by the workman in overcoming difficulties that could not be foreseen. Much of this, however, can be simplified by the use of a proper system. For instance, in the making of measurements for large pipe, etc., such as will have to be made at the shop, a form can be devised that will aid the fitter in laying out his work and will also prevent additional work in the drafting-room to get the matter straightened out and place responsibility where it belongs.

### FORM FOR PIPE SKETCHES.

To this end the form shown in Fig. 5 is submitted which should appeal to the contractor and to his workmen, and at the same time assist both and prevent loss of time and disputes.

The form is laid out in cross-section lines, eight to the inch, with an index at the top showing the eight and the half, or four, so that the lines can be easily recognized without too much counting. On these sheets can be laid out fairly accurately, the piping showing how it will look when cut. In the same manner, other sketches can be made for hangers, clamps, forgings, etc., so that they can be easily understood and the work correctly executed according to order.

The form could be mounted as a stiffly-backed pad, with the original form on the outside and with two blank sheets underneath of different colors. Thus by the use of carbons for each sheet, three copies may be obtained from one drawing. The original, of course, would be sent to the shop for office record, the second to the pipe-cutter or blacksmith, as

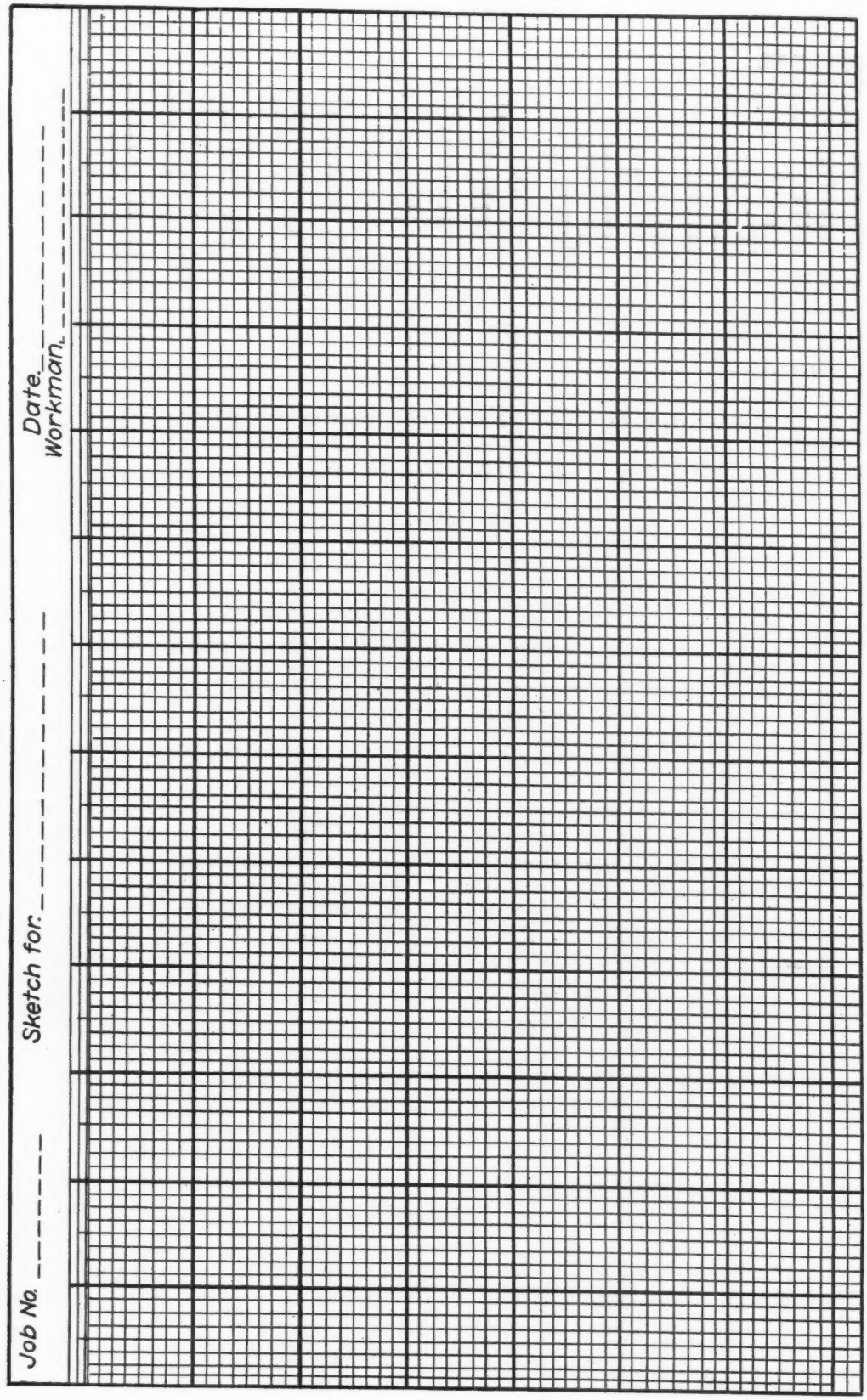


FIG. 5—FORM FOR PIPE SKETCHES.

the case may require, and the third would be kept on the job for the workmen to check the delivery and verify the layout. Then, in case of a mistake, it can be easily traced.

This same sheet may also be used to advantage in ordering general materials, as there is plenty of room for a number of items. In this way it serves to prevent a multiplication of order sheets.

FORMS FOR RECORDING PROGRESS OF WORK.

Supervision and superintendence are essential to the development of all work, and, therefore, if the contractor employs labor for the superintendence of the installation, there should be some method of recording the progress so that in the supervision the contractor or his assistant, appointed for such work, may know from day to day, or at various periods, how the work is progressing.

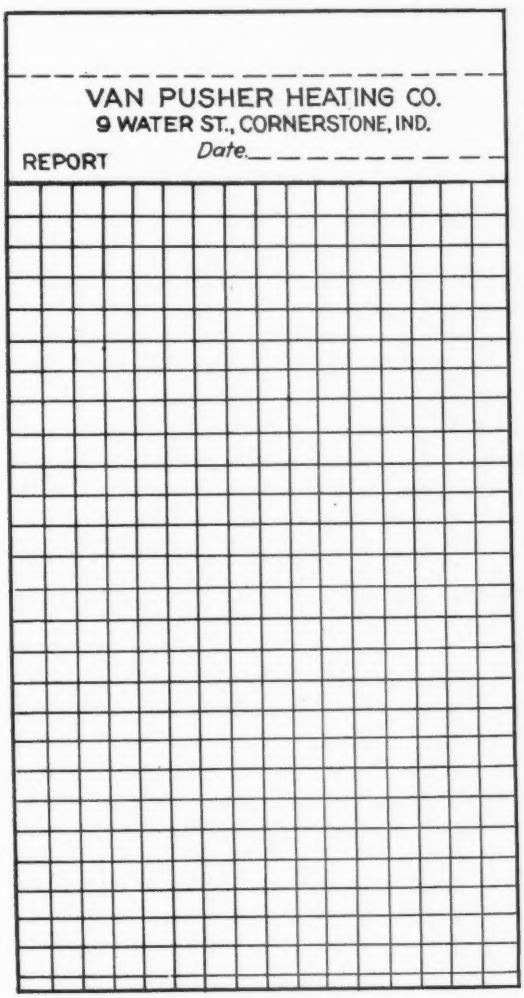


FIG. 6—FORM FOR RECORDING PROGRESS OF WORK.

Therefore, a duplicating form will appeal to many, which may be used either in the form of a book or loose-leaf folder, in which a record may be made so that the contractor's office has on file at all times a record and, if made in duplicate, the superintendent will have the same record.

With these records any disputes or complaints may be easily traced, while the ordinary method of word of mouth often leads to misunderstandings. A pocket-size note-book, with detachable pad, made up with the lined leaf, perforated for detachment, and a yellow underleaf fixed for use with a carbon sheet, will fill the bill. A stiff cover for the pad, with a clamp-holder, will be found the best. The pad may be plain or cross-section ruled. Also, if desired, the sheets can be printed with the contractor's name, which is advisable for proper identification. One of the most appropriate forms for this purpose is shown in Fig. 6.

This sheet is cross-ruled for convenience in case of sketches for elucidating some point that cannot be clearly stated and, as it is often necessary to have in hand reminders of the work so as to give proper directions on the job, by the use of this form the superintendent can aid the men on the job and have a record of his instructions. These sheets are valuable also where it is necessary to make modifiactions in the construction which will involve extra work and will be a record for extra charges and invoicing. Disputes often arise after work has been done, and, with the descriptions in these sheets, they can be clearly shown and identified.

TYPICAL TIME CARDS.

There is another point that will require better attention than is usually given by contractors, such as a record of the time spent on a piece of work. As it is not always convenient to keep time-keepers on jobs, the contractor usually has to depend upon the workmen for a proper description of the work done covering the time sheet. If properly arranged, a sheet may

VAN PUSHER HEATING CO.
9 WATER ST., CORNERSTONE, IND.
TIME CARD

Job Name._____ Contract._____ Extra._____

| | Main Steam " Branches | Main Return " Branches | Risers Air Risers | Radiators " Branches | Connecting Radiators | Feed Pipe Blow-off | Power Main. Exhaust " | Drip Pipes. Traps. | Engines. " Conn's. | Pumps. " Conn's. | Vent Pipes. Tanks. | Boilers. " Trimming | Coils. " Supports | Special. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FRIDAY | | | | | | | | | | | | | | |
| SATURDAY | | | | | | | | | | | | | | |
| MONDAY | | | | | | | | | | | | | | |
| TUESDAY | | | | | | | | | | | | | | |
| WEDNESDAY | | | | | | | | | | | | | | |
| THURSDAY | | | | | | | | | | | | | | |

Week Ending._____ Fitter._____

Day._____ Night._____ Helper._____

Approved._____

NOTE: Describe carefully all extra work on back, also overtime work.

NOTE: Sunday and overtime work to be shown on separate card.
Description of work done.

(REVERSE SIDE OF CARD)

FIG. 7—TYPICAL TIME CARD.

be evolved that will save considerable argument, especially with extra work. Therefore, the sheet shown in Fig. 7 may be used to advantage.

By the use of cards, like Fig. 7, it is possible to have a handy record of what is being done on the job. The card is so arranged that the fitter and helper can show where they spent their time without feeling that the supervision will cause disputes as to the amount of time they consume on some parts of the work, since the sheet will be a record of what they have done and, if any criticism is made, they can explain the difficulties and cause.

The card should be stiff and as tough as possible. The best material to use for this purpose is heavy manilla paper or a heavy rag paper or cardboard which will be easy to write on.

The use of the card is simple, as the sections can be ticked off, with the hours that have been spent on any item placed in the proper space. Thus, if two hours are spent on one item and six hours on another, the sheet shows the total hours for that day.

Every job should have a number as well as a name and, if classed as extra work, the word "contract" can be scratched out. Also, in some cases, there will be additional orders on the same job; therefore, space is allowed for such additions to the job number, such as A. B, etc., as the case may be. If the work is done in the daytime the user scratches out "night," or vice versa, and signs under his occupation, such as helper or fitter, with the date ending the week on a Thursday, so that the payroll may be made up for payment on Friday.

Each man should have a card and sign it himself with his own signature. When on extra work, he should give a good description of the work on the back of the card for identification and, as noted in the instructions printed on the card. In this way the work done is a record for

the contractor and a verification in case of disputes in making charges for such work when done.

CARE OF MATERIALS AT THE JOB.

In the organization of the work at the job considerable help can be given the workmen by a proper delivery of materials, arranging them at the shop so that they may be easily handled at the job. Many shops ship the materials in mixed lots in such a manner that hours are spent by the workmen in assorting them and placing them in order so that the required fitting can be located without going over the whole lot. For this purpose a rack could be sent with the first shipment, such as that shown in Fig. 8, for all small fittings such as ells, tees, nipples, etc. Also a series of boxes should be provided for larger fittings, as shown in Fig. 9. When additional fittings are sent from the shop it is a good plan to string them so that they may be handily placed on the rack or distributed where more than one size is strung.

The methods suggested will assist the workmen and at the same time keep the threads clean and free from grit, making it easier to make up joints and prevent leaks. Compare these methods with those usually followed by laying out fittings on the floor where they are likely to get full of plaster, etc., and become mixed with the debris.

Where the operations are large several of the racks and boxes can be placed at convenient points which will dispense with the need, in some instances, of climbing ladders to get to the central point, perhaps far from the working base, to get the required fittings. Fittings such as tees can be placed upon the rods and, with a large washer and a nut and thread on one end, can be slipped off one at a time and the nut replaced. In the same way, ells can be placed on chains and, with a small hook on one end looped in the ring at the top, can be strung from the S hooks on the rack and kept in order at all times. Hangers may be located over the lower rail and tools placed on the rails or hooks, as well as the fittings.

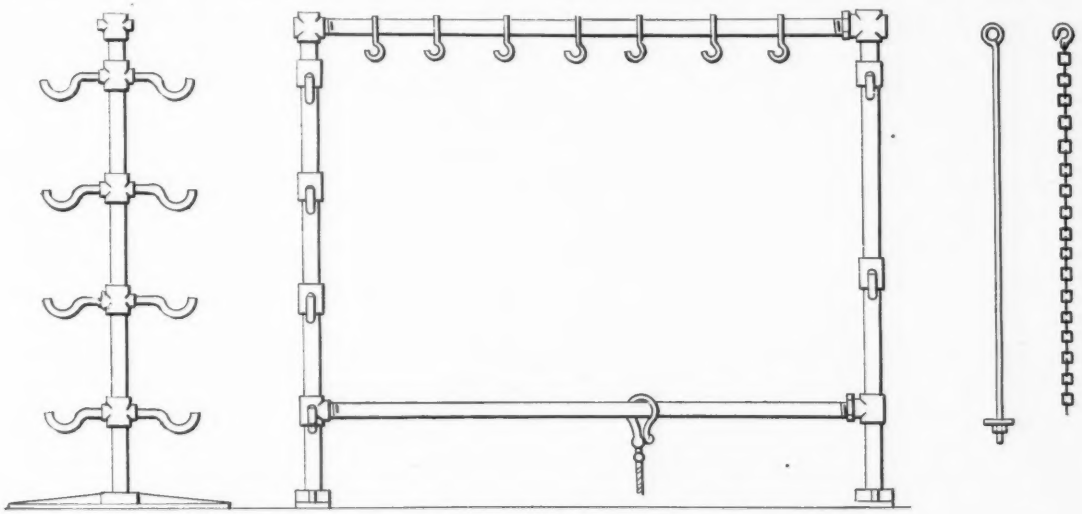

FIG. 8—PIPE AND FITTINGS RACK FOR USE ON JOB.

With the boxes shown in Fig. 9, the fittings can be kept in the same order as they are at the shop and the boxes may be placed one above another so as to save space on the floor. Two or three of these boxes will more than

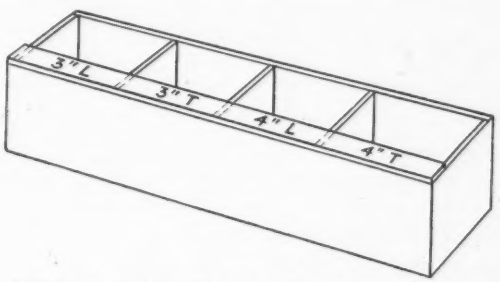


FIG. 9—BOX FOR LARGER FITTINGS, FOR USE ON JOB.

VAN PUSHER HEATING CO. DATE _____
9 WATER ST. CORNERSTONE, IND.

JOB_____ CREDIT MATERIALS CHARGED TO_____

| QUANTITY | MATERIALS | VALUE | |
|---|---|---|---|
| | | | |
| | | | |
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FIG. 10—JOB-TO-SHOP SHEET.

save their cost on one job. Look over the items charged to the job for barrels, bags, etc., and consider how much easier it would be if the assortment was sent in strings which cost practically nothing, to say nothing of keeping the assortment classified.

STOCK KEEPING AND CHARGING OF MATERIALS.

Stock keeping and the handling of materials from the stock and charging them to the work calls for some remarks, as in many cases materials are taken from stock without proper credit, and therefore, do not appear in the contract book of items. While in some cases these items are small, they represent values that should be charged, not only at their actual cost, but with some regard for the handling. How many small shops have a duplicating register on which these items are charged? Here is a possibility of loss, if not properly watched.

The writer has been in many shops where the fitter or helper came in for some small item and called out to the shop-keeper or others in the shop that he was taking it. In nine cases out of ten the item was forgotten. On this account a proper duplicating register should be in every shop and all materials taken should be recorded thereon and signed for by the party taking them. Instances occur where items have been taken from the stock-room and sold without any record being made as to who took them or what they represented.

There is another point of leakage in the charging of materials such as are used on extra work on a job, where the items are taken from those charged against the job under the contract. In such cases a proper itemized list should be kept of the materials so that the contract can be credited with them.

As a suggestion towards this end, the sheet shown in Fig. 5 may be used to advantage without additional printed matter, but a proper sheet for this item would save considerable. Because of the difference in the arrangement of such a sheet it would be easy to distinguish it and it could, therefore, always be kept separate from the general ordering sheets. This form would also be available for all unused materials sent to the shop from the job and, if properly made and the items arranged in order, would save considerable time at the shop in reassorting so as to give proper credit.

A job-to-shop sheet made up in pad form with duplicating carbons which could contain all items and then be signed by the counter or maker, will pay

for itself quickly. A suggested pad is shown in Fig. 10, the original to be filed at the office and the duplicate given to the shop-keeper, while the triplicate would be kept by the fitter or whoever sends in the materials.

In this sheet all items can be carefully credited at the job and if the materials have been used on extra work the space arranged would be marked "charge to" the extra job, under its initial letter or number, and the credit would be made under the caption marked "Job No. ——." Similar entries would be made if the materials were sent to the shop. As the original would be filed in the office, the bookkeeper could figure on this sheet the value of all items, and, with the duplicate in the shop-keeper's hands, the items could be checked and distributed into stock if used on the job, they should be verified by the superintendent and these duplicate lists sent into the office. In case of any discrepancy in the items, the value would be instantly apparent and the party responsible for it would be charged with the difference.

It often happens that goods are lost in transit and while some may be actually lost, some are frequently stolen. If the record is properly kept, the party sending the materials will have protection through the triplicate sheet and in this way the loss may be traced.

In some cases this form of sheet could be used to advantage in tracing goods ordered from the shop, where they are shipped directly to the job from the manufacturer or jobber on a general office order. When so used, they act as a verification of the order or it might be well to consider that all materials come from the shop and these verification sheets would then be used as charge and credit to stock account. In this way materials ordered to be delivered to a job, if charged and credited to stock account, would keep the stock account in a more perfect balance because there are many things that come back from jobs that are placed in stock and are never properly charged to this account, resulting in the stock being loaded with considerable inactive material.

In the crediting of returned materials it is advisable to have a shop-keeper who is familiar with such materials as are not of full value. Therefore, on the sheets returned to the office the true value may be ascertained and proper credit made, as often there is old material sent in that requires attention and repair which, in come cases, is of practically no value. Therefore, by using good judgment the stock values will not be made up of worthless material such as is found in many cases in going through the stock of contractors who fail.

In the writer's judgment, a discount of 10% should be made on all returned material, so that it will recompense the stock account for the handling. In the same way some percentage should be added to materials taken from stock. By following this procedure there will be a better balance in the stock account at the annual stock taking.

(*To be continued.*)

AUTHOR'S NOTE.—*In the first and second paragraphs of the first installment of "Systems for the Engineer and Contractor," published last month, the reading is slightly different from that which the author intended. The words, "master steam fitter" and "master plumber" are used instead of "steam fitter" and "plumber." They were so classed (as steam fitters and plumbers) by the parties with whom the writer talked and, from the author's observations, these parties had in mind many of this class who call themselves steam fitters and plumbers.*

*In the second paragraph, the statement should have been plumbers "and other mechanical branches," which is more to the point. For instance, in a certain lawsuit, the plaintiff asked judgment for making a feather bed, and other furniture, and also for installing a hot water heating system.*

# Hospital Ventilation from the Engineer's Point of View

By A. K. Ohmes.

*From a paper read before the Section on Hospitals at the meeting of the American Medical Association, held at Atlantic City, June, 1914, and published November 7, 1914, in the Journal of the Association.*

There is, of course, no medical man who does not value "pure fresh air," who is not deeply interested in securing it, whether in the so-called "natural" way (by means of open windows) or in the so-called "artificial" way (by means of a ventilating system) and who would not treat this subject with an open mind, ready to hear arguments for and against either method. Similarly every architect and engineer should treat the subject with an open mind, ever realizing that by far the greater portion of humanity lives and remains happy and healthy in its homes, where only the so-called natural or window ventilation exists. The special object of this paper, however, will be to bring forth arguments of how far artificial ventliation might prove helpful in solving the problem of the positive, simple and effective supply of fresh air and the removal of vitiated air, irrespective of wind and weather, under ever-varying conditions, in many different departments of a hospital.

### INDIVIDUAL OPINIONS DIFFER AS TO QUALITY OF INDOOR AIR.

Let us be frank and acknowledge that a number of persons in any enclosed space are rarely in perfect agreement as to the quality and freshness of the confined air, and that particularly in the cold season of the northern climate, whatever the reason, the most glaring disagreements exist. This condition is well known, and it makes no difference whether the fresh air enters a room through an open window or is introduced by an artificial ventilating apparatus. We must further acknowledge that it is difficult, nay, useless, to combat the idea that the best and purest air is not secured from and through open windows when surroundings are park-like—in other words, ideal; but that it is easily combated when windows face ill-smelling, dirty and dusty streets, courts or backyards.

It can therefore be easily proved that artificial ventilation is unnecessary in a spacious country home when inhabited by few persons, but on the other hand, it has been proved that humanity does wilt and waste away in overcrowded factories, schools, offices and laboratories unless artificial means for supplying fresh air and for removal of vitiated air, in addition to window ventilation, are provided.

### MOVEMENT OF AIR THROUGH LONG DISTANCES AND HEIGHTS.

With proper application of engineering data and skill, fixed quantities of air can be moved through long distances and heights, even though large and powerful machines may be required in the most difficult cases. As records of long distances we must think of the artificial ventilating systems required for the building of railroad tunnels, where air for the tunnel builders was driven to their working places through pipes frequently from 6,000 to 8,000 ft. long.

As a record of height, we may mention the Woolworth building in New York City, covering an underground area of 225 by 292 ft. The vitiated air of the cellar (largely containing the engine and boiler rooms) and of the basement, containing underground safe-deposit vaults, swimming pools, restaurants, kitchen, etc., is collected, and thence, with an ordinary blower, requiring but little power, discharged above the roofs. In one case the horizontal distance is as much as 360 ft. and the vertical distance up to the fiftieth floor about 710 ft., making a total air travel of 1,070 ft.

### MOST DESIRABLE TEMPERATURES WITH 60 PER CENT. RELATIVE HUMIDITY.

For over ten summers an artificial cooling, humidifying and ventilating plant has been in operation in the New York Stock Exchange, where 1,500 persons are busily engaged with closed windows, as

is necessary where cooling is desired. Of course, this room is not cooled to the constant winter temperature of 68° F. The room temperature best liked by the average person seems to bear a fixed relation to the outside temperature and the vapor content. The most suitable inside temperatures with corresponding outside temperatures at about 60 per cent. humidity are as follows:

| | |
|---|---|
| 68° F. outside | 68° F. inside |
| 75° F. outside | 72° F. inside |
| 80° F. outside | 74° F. inside |
| 85° F. outside | 76° F. inside |
| 90° F. outside | 78° F. inside |

WINDOWS IN BANKING ROOMS SELDOM OPENED.

Many banking rooms having large windows are located on the street level of lower New York City, but have, nevertheless, artificial ventilating plants. While windows in large banking rooms can be but seldom opened in the winter months because the quietly sitting bank people complain of unbearable drafts, it is even preferred in many cases to keep them closed in the summer months. The reason for this is that the dust from the streets, the cinders from smoke flues, and the latest nuisance of gases from the motors of automobiles and trucks will come into the rooms with the "fresh air" as secured by the windows. Noise from street traffic is also found most objectionable for rooms of this kind.

It would, finally, be extremely simple to cite many theaters, factories, laboratories, toilets, etc., to impress further the importance of artificial ventilation in our advanced civilization, with its ever-increasing indoor life.

TOP AND BOTTOM VENTILATION.

As to the air supplied by a well-designed ventilating apparatus, proper operating conditions taken for granted, it may be worse or better than that secured from the windows for reasons already stated. It is simple to temper the air with our common steam and hot-water heating systems and their common heating surfaces without taking away any of its life-giving qualities. Air can be introduced or taken out near the top or near the bottom of a room. In the greatest part of the United States it is best to supply air at the top, because a larger amount can be introduced for the greater part of the time with the least draft; but in the summer months it is frequently found that the best results are secured in "reversing" the air currents, that is, introducing the air at the bottom and removing it at the top. The reversing of the air currents can be easily, cheaply and positively accomplished by the operation of a single damper.

OPERATION OF AIR WASHERS.

Dusty air can be easily cleaned of its larger mechanical impurities without undue expense by means of air washers and air filters. When air washers are used there is, in case of non-operation, always the possibility and danger of water becoming stagnant. Dry filters of the cheese-cloth kind are, therefore, more "fool proof" from this point of view, but not so effective as far as dust removal is concerned. The use of air washers for filtering purposes will at the same time moisten the air, and will also cool the air at such times as the outside air is relatively dry. Under what conditions air moistening is important to health has as yet not been scientifically settled, but it mainly depends on whether the climate is ordinarily dry or moist. With dry filters, air-moistening pans may be used, and again there is the danger of stagnant water in case of non-operation, if the pans are not drained out properly.

Artificial cooling with dehumidifying, while probably important in warm and moist climates, is on account of the usually high operating expenses, very seldom done, but cooling effects by means of desk fans, due to rapidly moving air currents, may be secured at little cost.

Finally, we may add ozone to the air at little expense for "bacteria removal," etc. While again the researches of the good of this treatment of air are not conclusive, it seems, nevertheless, to be the consensus of opinion of doctors who have given the matter consideration that as much harm may be done to the human beings as to the elusive microbe.

We are, therefore, quite positive in making the statement that we can "condition" the air supply of an artificial ventilating plant to almost any extent. On the other hand, the less "conditioning" necessary, with the exception of the heating

and cooling of air and of adding moisture (which depend entirely on the climatic conditions), the better usually the ventilating apparatus is. Air for any artificial ventilating apparatus should preferably be taken from a point that is so pure and clean as to make any other "air conditioning" unnecessary, which, unfortunately, is but seldom possible in our crowded cities.

### TEMPERATURE TO WHICH AIR IS HEATED BY STEAM AND WATER.

As to the heat required for warming the cold air coming into the windows, or as supplied by the artificial ventilating apparatus, only two heat mediums need be considered at the present time, and they are steam and water.

Steam is usually at low pressure, and with the ordinary commercial heating surfaces the air can be warmed to about 140° F. If water is the heat-carrying medium it may be circulated by gravity actions or by pumps, and in either case it is with commercial heating surfaces difficult to heat the air to more than 130° F. Steam (as well as water, if its circulation is forced by pumps) has been carried great distances from one central point, and a distance of a mile is not unusual any more.

### PRACTICAL PROBLEMS IN HOSPITAL VENTILATION.

After these few, necessarily short, general remarks on vetilation and ventilating systems for different kinds of buildings, the question now arises, where does the hospital stand in relation to ventilation, and where does it materially differ from other buildings so far as ventilation is concerned? Consider first of all that any large hospital contains many different rooms, serving many different purposes. For the greater part of this country, active air supply and exhaustive ventilation are usually required in operating rooms, operating theaters, bathing and therapeutic departments, dispensaries and underground boiler and engine rooms, kitchens, laundries, etc. Practice has also proved that the air supply must be warmed to different temperatures. A low temperature is necessary in cases in which a heat removal is desired, and a high temperature must naturally be carried for rooms having persons with scant or no clothing.

Exhaust ventilation for all rooms in which odors, gases and vapors are created is absolutely necessary. Among these rooms we may mention toilets, utility rooms, slop and specimen closets, laboratories, store rooms, animal rooms, etherizing and sterilizing rooms. It is, of course, realized that there may be conditions in any climate in which in each instance any room may be built of such large area and height as to make artificial ventilation unnecessary. If it were attempted it would probably be found that building and operating costs would be greater, provided as good conditions were to be secured in these rooms without artificial ventilation as with artificial ventilation.

Bedrooms for doctors and nurses should be so well located as not to require any artificial ventilation.

At present, however, when the necessity of artificial ventilation of a hospital is considered, the ward seems to be the one point on which the entire discussion centers; and frequently, if the wards have no artificial ventilation, but many of the rooms mentioned above have, it is simply stated that the hospital has "no artificial ventilation."

As to the wards, it must be said that they usually occupy the choicest location of the site. Furthermore, most hospital sites are naturally well chosen as far as sun exposure and prevailing winds are concerned, and regulations as to unnecessary and objectionable noises are enforced in all large cities. In addition, the rooms are large, figures showing that the cubic contents per bed in a ward are usually four times that provided per person in good offices and eight times that in a schoolroom. Again, most wards have windows on two or three sides, making through draft possible. Admitting that conditions are in every way ideal, what, then, are the possibilities of securing in all kinds of climatic wind and weather conditions the much-wanted air renewal by the windows?

### EFFECT OF OPEN WINDOWS.

The opening of windows is ordinarily not objected to by anybody when the inside and outside temperatures are sub-

stantially the same, or when the outside temperature is higher. If it is some degrees cooler outside than inside and the cold air enters through windows, it mixes but exceedingly slowly with the warm room air, and consequently it sinks to the floor, thus creating a difference of temperature between floor and height of head, and chilling of the occupant may take place. In addition, excessive drafts are also occasionally created under careless openings of windows on gusty, windy days. Of course, the doctor, busily engaged or walking through the room, or a patient in bed covered well with blankets, will but seldom find drafts and unequal temperatures objectionable. Still, drafts exist, as we all know, and any heating engineer can quote many experiences where even the downdrafts due to heat transmission from tigthly closed large windows in business and amusement places, or in churches and halls, are found annoying by most persons. If the same persons do not object to in-drafts from open windows in a hospital, it is because of the usual uncomplaining ways which practically all persons pursue in dealing with any arrangement the "doctor" makes, the great and good man in the time of need and distress. His word is law, and it is but right that it should be—in the ward and sickroom.

### COMPLICATIONS DUE TO PATIENTS' AILMENTS.

It is not in the province of the ventilating engineer to decide whether or not, and how far, unequal temperatures and cold drafts may be harmful to the human body, all the more to the ailing human body. From my own observations in other rooms the habit and disposition of each individual should be taken into account. Consider also that there are wards for bodily and mentally sick patients, for quiet and restless feverish patients, for patients with external and internal sicknesses, for patients that require and do not require bed treatment, for patients with contagious diseases, etc. The matter is still more complicated when we consider that there are wards with all these different kinds of patients for adults, children and babies.

### CLIMATIC CONDITIONS A FACTOR.

As a final consideration, may it not be proper to point out that hospitals, and with them wards, are necessary on the Panama Canal as well as in Alaska? It is questionable that there is a ventilating engineer who would advocate the closing of windows in a ward in the former place, with perhaps 110° F. in the shade, and rely for the best air conditions on the artificial ventilation without cooling, or that there is a doctor who would maintain that it is best for securing ventilation to open windows in—50° F. and let—50° air directly enter a window instead of warming it first over steam coils. It is evident that climate conditions form an important part in deciding whether or not artificial means of supplying air in a ward are necessary and valuable.

Generally speaking, it is, of course, but right for the ventilating engineer to presume that if certain methods of ventilation in a certain climate are appreciated by healthy persons, such methods ought to be also appreciated by sick persons! Indeed, who will question the correctness of the Samaritan view that if at all possible sick persons should be still better taken care of?

If, therefore, the men in charge of the best bank, business and commercial houses, department stores, insurance offices, theaters, lecture rooms, etc., find it so often profitable to provide artificial ventilation for the same, why should it not be good for a ward? These and similar questions the designing engineer seeks in vain to answer to himself when he sees his ventilating plants in other buildings usually operating successfully, even though for obvious reasons not pleasing to every one, but finds his work in one department of the hospital lying idle for no specific or scientific reasons. If as a reason an undue high operating expense is given, or questions are dismissed with such familiar answers as "no artificial" ventilation is necessary in "our climate" for "our wards" with "their large windows," "fine exposure," "special bed arrangement," with our "carefully instructed nurses manipulating the windows and window ventilators," no particular harm is done. If, however, the non-operation is put on the score that all artificial ventilation is wrong, much harm

is done to those who perforce have to be in places less fortunately located than most wards in hospitals.

That the operating expenses should present no insurmountable obstacles, the accompanying table may prove.

ANALYSIS OF OPERATING EXPENSES. USING STEAM FOR HEATING.

In looking over the schedule it will be noted that the installation expenses are considerably higher for an artificial ventilating apparatus than those of merely making provision for heating by radiators an equal amount of air entering the windows. It will increase the building expenses all the way from $12.20 to $19.80 per bed, according to the apparatus selected. While this would seem considerable, still, it cannot be called excessive when one considers that the entire cost of building construction and equipment of a hospital is frequently from $4,000 to $5,000 per bed; in other words, the building expenses are increased approximately 0.5 per cent. No allowance, however, has been made for the possible increased cost of providing the required space conditions of blowers and flues. There are cases in which the additional cost is negligible, whereas in other cases the additional cost is considerable.

It should also be noted that the cost

AVERAGE THEORETICAL COSTS OF INSTALLING AND OPERATING WINDOW AND ARTIFICIAL VENTILATION.*

*At 4,000 cubic feet per bed, per hour, under various climatic conditions; twenty-four-hour service for running blowers, exhaust fans, pumps, etc., and 365 days per year.

| | | | |
|---|---|---|---|
| Temperature of average winter, deg. F. | 45 | 35 | 25 |
| Number of days on which the air supply must be heated.. | 150 | 180 | 210 |
| Neighborhood of assumed conditions | Norfolk | Cleveland | Min'polis |
| Cost of installation per bed: | | | |
| Window ventilation with increased radiators, piping, also increase of boiler capacity | $ 9.60 | $11.70 | $14.20 |
| Artificial ventilation with tempering coil, motor, duct work, fans, and cloth filters | 26.60 | 27.00 | 27.40 |
| Artificial ventilation with tempering coil, motor, duct work, fans, air-washers and pumps | 29.40 | 29.80 | 30.20 |
| Cost of operation per bed at 4,000 cu. ft. per hour: | | | |
| Cost of steam at 35 cents per thousand pounds, which includes cost of coal and water, removal of ashes, also cost of labor, rental value of space occupied, and interest, depreciation and maintenance on cost of boiler plant. Per Bed for time stated | 2.21 | 3.78 | 5.83 |
| Totals: | | | |
| Window Ventilation: | | | |
| Cost of steam | 2.21 | 3.78 | 5.83 |
| 10 per cent. interest, depreciation and maintenance of plant | .96 | 1.17 | 1.42 |
| Total per bed | $3.17 | $4.95 | $7.25 |
| Artificial ventilation (air filters only): | | | |
| Cost of steam for heating air as above | 2.21 | 3.78 | 5.83 |
| Cost of electricity at 2 cents per kilowatt hour driving fans | 3.36 | 3.26 | 3.16 |
| 10 per cent. for interest, depreciation and maintenance on investment | 2.66 | 2.70 | 2.74 |
| Total per bed | $8.23 | $9.74 | $11.73 |
| Artificial ventilation (air washer and humidifying air): | | | |
| Cost of steam for heating air as above | 2.21 | 3.78 | 5.83 |
| Cost of steam for humidifying air (approximate) | .60 | .80 | 1.00 |
| Cost of electricity at 2 cents per kilowatt hour for driving fans and pumps | 6.28 | 6.00 | 5.80 |
| 10 per cent. for interest, depreciation and maintenance on investment | 2.94 | 2.98 | 3.02 |
| Total per bed | $12.03 | $13.56 | $15.65 |

The results are average conditions for hospitals of say 500 patients in which coal and labor is of average cost. Operating expenses will be more for hospitals not having their own power plant. No cost and operating expenses for heating of any kind are included in these figures.

for electric current appears rather high, but the artificial ventilation has been figured to run all the time (twenty-four hours per day and 365 days per year), and air is to be supplied under pressure by a blower and exhausted by an exhauster.

Similarly the cost in operating expenses under the same climatic conditions are approximately increased from $4 to $8 per bed per year, according to the apparatus installed. Hospitals seem to expend not less than $800 per bed per year for the maintenance and operation, interest charges, etc. Consequently on this basis the operating expenses would be increased by the artificial ventilation from 0.5 to 1 per cent. If we were to reduce the operating expenses for artificial ventilation to a daily basis we would find that they would amount to the small sum of from 1 to 2 cents per day per bed over the window ventilation.

These figures are based on heating the air by a steam-heating apparatus, and the difference in expense for hot water heating will be slightly less.

EFFECT OF RECKLESS CRITICISM OF ARTIFICIAL VENTILATION.

In conclusion, may I be permitted to express the hope that the efforts of this symposium may at least result in obviating the oftentimes reckless criticism of all artificial ventilation by the medical profession when discussing ward ventilation? If not, the prediction would seem in order that there will be retrogression instead of progress in the ultimate solution of proper ventilation of some of our subways and tunnels, of some of our factories with poisonous dust and gases floating in the air and inhaled by the workmen, of dingy offices, of ill-smelling moving picture show places, of some of our stuffy hot engine and boiler rooms, our schools and lecture roms, our hot kitchens and laundries, etc. Living and healthful conditions depend in thousands of these places on artificial ventilation, and if it were altogether discarded, more institutions for taking care of sick and maimed must be built in the future than ever before. On the other hand, it is also realized that it is best not to have air conditions depend solely on artificial means, and that all the so-called "air conditioning" never has to most people, if indeed to any at all, the same effect as at times an open window, which is particularly true in the warmer weather. In our city and manufacturing life, however, ideal air conditions do not now, and probably never will exist, and therefore artificial ventilation will always be called on to do its share in overcoming the shortcomings of window ventilation in many of the hundreds of different confined spaces required by our complex civilization.

## *The Practical Aspects of Electric Heating*

In the application of electric heaters for warming purposes the practice followed in the equipment of street cars is furnishing some valuable data. In a paper, for instance, by William S. Hammond, Jr., vice-president of the Consolidated Car Heating Company, presented at the recent summer meeting of the American Society of Heating and Ventilating Engineers, the speaker had some interesting things to say on the general subject, as well as on its bearing in connection with the heating of street cars.

After calling attention to the fact that the highest efficiencies in such apparatus as steam boilers, steam engines and electric motors are attained in large and well-proportioned units, the speaker stated that in electric heating, large and small heating units are equally efficient and for this reason electric heaters readily adapt themselves for use in locations widely separated and in which small amounts of heat are required. Dividing electric heat into a large number of small units does not, therefore, mean loss of efficiency.

100% OF EFFICIENCY REALIZED IN ELECTRIC HEATERS.

The high efficiency of electric heaters is due to the fact that the electric heater is the only form of translating device in which 100% efficiency is realized. It is

well known that energy is indestructible. It is wholly converted in every translating device. It is true that translating devices generally convert energy into several forms and, therefore, any one form of energy contains less than the whole. Electrical apparatus generally transforms into the desired form of energy less than 100%. Now if the theory of the conservation or persistence of force is true, all of the energy can be accounted for in some way.

Let us examine, for a moment, the forms of energy into which electricity may be converted, first, mechanical motion; second, chemical action; third, light; fourth, magnetism and fifth, heat. This list, the author believes, comprises all possible forms of power into which electrical energy may be transformed.

By reference to the table, the author has attempted to show some of these transformations.

100 UNITS OF ELECTRICAL ENERGY TRANSFORMED.

| By | Electrolysis | Motor | Lamp | Elec. |
|---|---|---|---|---|
| Mechanical action | .. | 90 | .. | .. |
| Chemical action | 50 | .. | .. | .. |
| Light | .. | .. | 10 | .. |
| Magnetism | .. | 2 | .. | .. |
| Heat | 50 | 8 | 90 | 100 |
| Total | 100 | 100 | 100 | 100 |

It is assumed that we transform 100 units of electrical energy by different devices. Out of 100 units of electrical energy employed in the operation of electrolysis, we find that no mechanical motion is produced, chemical action 50%, no light, no magnetism and 50% of heat is produced, or a combined total efficiency of 100%. If we take the electric motor, we find that it is impossible to build an electric motor without resistance, and when a current passes through this motor we always obtain heat. Therefore, in 100 units of electric energy which are transformed in the motor, 90% approximately, may be transformed into mechanical motion, no chemical action is produced, no light, two units transformed into magnetism and eight units in the form of heat, giving us a total of units of energy in these different forms of force of 100, or exactly equivalent to the number of units of electrical energy with which we started.

If now, we consider the incandescent electric lamp and transform 100 units of electrical energy, we find no mechanical motion is produced, no chemical action, about 10% in the form of light, no magnetism and 90% of heat.

Of course it is apparent that the so-called efficiency of each of these transformations depends upon the useful work which we are endeavoring to produce with the electric current. If it is the electric motor, 90% is realized. If the incandescent lamp, 10%, although, if we were using the incandescent lamp as an electric heater, we would call its efficiency 90%, instead of 10%.

We then come to the transformation in an electric heater. Again, we will employ 100 units of electric energy. We find that there is no mechanical motion, there is no chemical action, no light, no magnetism. Heat, therefore, must be the only form of energy into which the 100 units of electric energy have been transformed. The electric heater, then, is the only case that comes within our knowledge where 100 units of electric energy may be transformed into 100 units of any other one form of force.

### FIXED RELATION BETWEEN ELECTRIC ENERGY AND HEAT.

The fixed relation between electric energy and heat makes it easy to determine the amount of electric energy which is equivalent to a unit of heat. Careful tests have determined upon 1,047 watts as equivalent to 1 B. T. U. or 1 lb. degree F. Therefore, it becomes an easy matter to determine the exact amount of heat which is produced in electric heaters when the consumption of current is known.

For example, if we find the number of watts, by multiplying the number of amperes passing through the heater by the difference of voltage of the heater terminals and then divide the number of watts by 1,047, we will have for a quotient the number of British thermal units of heat generated in the electric heater per second. If we consider the electric

heaters in a car to be using as a maximum 12 amperes of current on a 500 volt circuit, we will find that 12 amperes of current multiplied by 500 will give us 6,000 watts. Dividing 6,000 watts by 1,047, we obtain 5.73 B. T. U. of heat generated in the car per second. Multiplying 5.73 B. T. U. by 60 will give us 343.8 B. T. U. per minute. This is equivalent to 20,628 B. T. U. per hour; or, since a B. T. U. is the amount of heat necessary to raise 1 lb. of water 1° F., the heat generated per hour would be equivalent to the raising of 20,628 lbs. of water 1° F.

In this way, with a given consumption of current, it is very easy to determine exact values in heat units, or if we know what heat units are required, it is a simple matter to ascertain the exact consumption of electric energy necessary to produce this amount of heat by means of the electric heater.

## *Test of a Hot Blast Air Tube Heating System*

RESULTS OBTAINED IN A TWO-DAY TEST AT THE PUBLIC LIBRARY, NEW HAVEN, CONN.

By E. H. LOCKWOOD AND A. C. STALEY.

*(The data contained in the following test were presented by Prof. Lockwood at the November meeting of the New York Chapter of The American Society of Heating and Ventilating Engineers.)*

The Free Public Library, built in 1910, at a cost of $400,000 is one of a group of prominent buildings facing the New Haven green. The structure is rectangular in outline, consisting of two parts, a main building 100 ft. square and a book stack wing 90x35 ft., with a combined space of 450,000 cu. ft.

The building contains three floors besides a sub-basement under part of the building for the heating plant. The basement floor, slightly below the street level, contains the children's room, the men's reading room, administrative and work rooms. The first floor contains the catalogue room, offices, reference room and fiction department. The second floor contains the art and technology departments and an exhibition room used intermittently and not regularly heated.

The library is open to the public daily from 9 A. M. to 9 P. M. The architect is Cass Gilbert, of New York.

As will be seen from the accompanying illustrations (which were first published in THE HEATING AND VENTILATING MAGAZINE for January, 1910, when the installation was made) the heating system consists of five air-tube heaters placed in the sub-basement, and an electrically-driven fan for forced circulation of warm air to the building. Two of the heaters serve to temper the air, which is then passed through an air washer and humidifier, finally reaching the secondary heaters where the temperature is further raised.

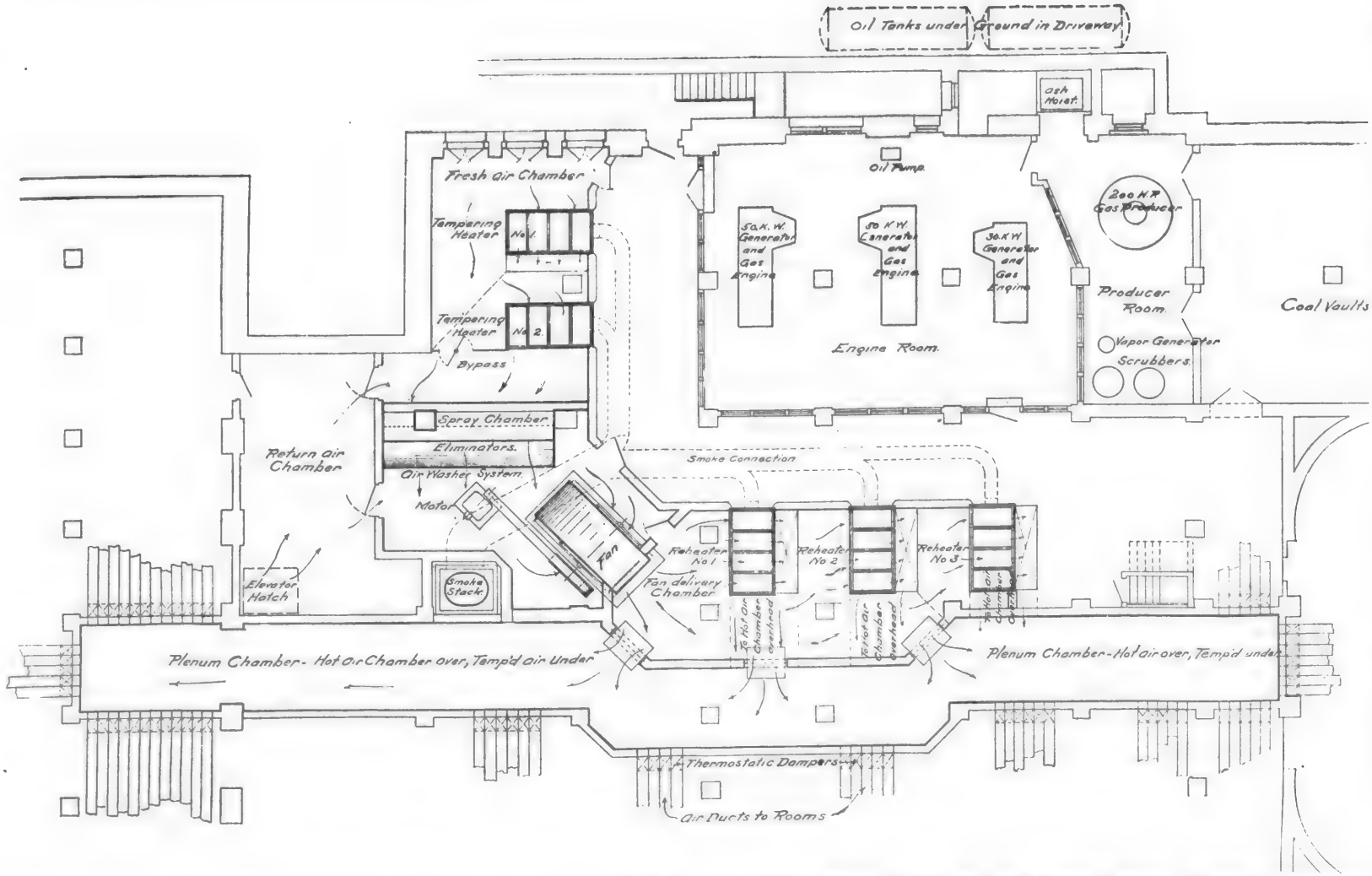
The heated air is delivered to a brick-lined tunnel in the sub-basement level extending the whole length of the building.

The tunnel is made with two parts, a hot-air plenum duct above and a tempered air duct below, the dimensions of each being 120 ft. long, 8 ft. wide and 5 ft. high. Sheet-iron flues lead from the plenum duct to the various rooms, with mixing dampers at the entrance to each flue, operating by pneumatic control from thermostats in the rooms.

The fan is a steel plate wheel 8 ft. in diameter, driven by a 15 H. P. electric motor. Provision is made for by-pass doors for recirculating the air from the basement when desired, instead of drawing in fresh air.

The arrangement of the heaters, fan, air washers, tunnel and vertical ducts is shown in Fig. 1.

The Harrison air-tube heater used is of special design, with 128 4-in. tubes, each 4 ft. long, containing 505 sq. ft. of heating surface. The grate surface is 3 ft. 2 in. wide by 4 ft. 6 in. deep, making 14.2 sq. ft. for each heater. The air passes through the 4-in. tubes while the




ARRANGEMENT OF HEATING AND VENTILATING APPARATUS IN THE IVES MEMORIAL LIBRARY, NEW HAVEN, CONN., SHOWING BRICK PLENUM TUNNEL.

*(Reprinted from the Heating and Ventilating Magazine for January, 1910.)*

hot gases pass around the outside, leaving the heater by a smoke flue at the top of the setting.

The heating system was laid out by Burt S. Harrison, of New York, inventor of the air-tube heater just described. The installation has proved satisfactory to the library management, and has earned a good reputation for economy of fuel.

### HOW SYSTEM IS OPERATED.

The method of operating the heating system at the library, evolved from several years of use, differs in some particulars from that contemplated by the designer.

First, the air is largely recirculated from the basement, instead of using the fresh but colder air from outside. This sacrifice of ventilation in the interests of economy has been deemed advisable and has apparently given satisfaction to users of the building.

Second, the air washer and humidifier has been largely dispensed with, since, with the inside air supply, there is less need of this treatment of the air.

Third, the furnace fires are in active use only a small part of the time. In ordinary winter weather the fires are banked about three-fourths of each day; that is, six hours with drafts on and eighteen hours with drafts off. Obviously there must be some storage capacity that enables the intermittent production of heat to maintain uniform temperature in the building.

The operating schedule for the furnaces and fan in winter is about as follows:

6 A. M., dampers opened, fires started up slowly.

7 A. M., fan started, basement air.

12 M., furnace fire checked; dampers closed.

5:30 P. M., fan shut down.

7 P. M., fires cleaned and banked for night.

The novel features of design and operation of this heating system attracted the attention of Professor L. P. Breckenridge, of the Sheffield Scientific School, and the following tests were made by the writers at his suggestion. The time chosen, December 23 and 24, 1913, proved to be mild days, not taxing the heaters much so that only three of the five were in use.

### SCOPE OF TESTS.

The tests were made to determine the economy of recirculating the air as compared with ventilation by use of fresh air, both under as nearly identical conditions as possible, except for the ventilation feature.

In addition to the measurements of fuel, temperature, air velocities, etc., the attempt was made to determine the efficiency of the system. The difficulties of this measurement are much greater for air than for steam systems. In order to check the result it was decided to find the efficiency in two ways, as follows:

First, by deducting from the heat in the fuel, as determined from analysis, the various furnace and flue losses, much as in a "heat balance" of a standard boiler test, assuming that all heat not accounted for is usefully employed. The item radiation from the setting is not a loss since it is usefully employed in heating the air.

Second, by comparing the heat in the fuel with the calculated heat loss from the building, based on the thickness of the walls, temperature differences, and heat loss coefficients.

### SUMMARY OF TESTS.

The heated portion of the building contains 431,000 cu. ft.; glass surface, 5,630 sq. ft.; 16-in. wall, 20,850 sq. ft.; 24-in. wall, 3,720 sq. ft.

Three heaters were used, grate surface, 14.2 sq. ft. each; heating surface in tubes, 505 sq. ft. each.

The fuel was washed pea anthracite coal, costing about $4.50 per gross ton delivered at the library. The amount used in 24 hours' test, when recirculating the air, was 987 lbs. with an outside temperature of 39° F. During the same period with ventilation the amount of fuel was increased by 75%, due to heating the cold air used, or 1,728 lbs. per day with an average outside temperature of 43° F. During both tests the average inside temperature was 69° F.

The coal was practically all fired dur-

ing the six hours, from 6 A. M. to 12 M., and the average rate of combustion per square foot of grate surface was only 1 lb. per hour during the recirculating test. The output of the boiler expressed in the familiar boiler horsepower unit was 12 average, and 28 maximum, for the recirculating test. The figures were 75% higher during the ventilating test.

The volume of air circulated by the fan was 25,000 cu. ft. per minute during the recirculating test, entering the tempering heater at 78° F. and reaching the tempering plenum chamber at 88° and the hot plenum chamber at 129°.

When ventilating, the volume was cut down to 15,000 cu. ft. per minute, entering the tempering heater at 43° and reaching nearly the same temperatures in the plenum chambers as in the other test.

The general economy of the heating system may be inferred from the annual coal consumption of 100 tons of pea coal per year, which is low for a building of this size, occupied for public use twelve hours per day.

The efficiency was measured in two ways: first by analyzing the fuel and deducting the heat lost in the flue gas by analysis and allowing for the losses in the furnace. The efficiency found in this way was 82%.

Second, by calculating the heat loss from the building from its dimensions and known temperature differences inside and outside during the day. The heat lost in ventilation was included. The efficiency obtained in this way was 83%, making a satisfactory check on the first result.

An attempt was made to determine the efficiency in a third way, by measuring the heat given to the air circulated, but this proved to be unsatisfactory, owing to difficulties in determining the proportion of air entering each of the plenum ducts.

A measurement of the plenum ducts, 120 ft. long, 8 ft. wide, 5 ft. high, showed that the heat capacity of the brick lining, together with the heater settings, was ample to account for the storage of the surplus heat generated during the six hours of firing with drafts on.

The conclusions made by the writers are that the heating system, with an efficiency of 83%, is unusually effective, and that the results obtained were at least 10% better than from a steam or hot-water system.

The cost of ventilating with cold air as compared with the cost in recirculating the air from the building, is 75% more when ventilating.

IMPORTANCE OF HEAT STORAGE FEATURE.

The heat storage feature is a valuable one, permitting the coal to be fired in the morning hours and thus releasing the boiler room attendant for other work during the afternoon.

The cost of repairs has been small and no trouble has been experienced in burning out tubes. This is due to care in operating the fires and in running the fan for some time after the fires are banked.

The cost of operating the fan for moving the air is properly chargeable to the heating system, and this amounts to $1 per day, or 25% of the cost of fuel. The amount of current used was 2 K. W. for 10 hours per day, purchased from the local electric company.

This installation proves that hot air furnaces can be operated economically and efficiently in large buildings, if laid out with care and operated with intelligence.

**Data and Results of Test.**

1. Type of heaters—Harrison Air Tube.
2. Number of heaters used in test—Three (one tempering).
3. Number of tubes in each heater—128.
4. Outside diameter of tubes—4 in.
5. Length of tubes—4 ft.
6. Heating surface (505 sq. ft. each)—1515 sq. ft. total.
7. Grate area (3 ft. 2 in. by 4 ft. 6 in. deep each)—42.7 sq. ft. total.
8. Kind of fuel—Washed pea anthracite.
9. Cost of fuel per 2,000 lbs. delivered—$4.50.
10. Diameter of fan wheel—8 ft.
11. Maximum horse power of fan motor—15.

| | | |
|---|---|---|
| 12. Date of tests | Dec. 23, 1913 | Dec. 24, 1913 |
| 13. Air supply | Recirculating | Ventilating |
| 14. Duration of tests, hours | 24 | 24 |
| 15. Time drafts on, hours | 6 | 6 |
| 16. Time drafts off, hours | 18 | 18 |
| 17. Time fan running, hours | 10.5 | 10.5 |

COAL AND ASH

| | | |
|---|---|---|
| Date of tests | Dec. 23, 1913 | Dec. 24, 1913 |
| 18. Coal fired primary heater, pounds | 348.5 | 461.5 |
| 19. Coal fired, secondary heater, pounds | 351 | 697 |
| 20. Coal fired, secondary heater No. 2, pounds | 288 | 570 |
| 21. Coal fired, three heaters, pounds | 987.5 | 1,728.5 |
| 22. Ash from three heaters, pounds | 101 | 213.5 |

AIR MEASUREMENTS.

| | | |
|---|---|---|
| Date of tests | Dec. 23, 1913 | Dec. 24, 1913 |
| 23. Areas bypass doors to basement (each), sq. ft. | 17.9 | .. |
| 24. Area ventilating window to outside, sq. ft. | .. | 15.2 |
| 25. Velocity of air at by-pass door No. 1, R. P. M. | 665 | .. |
| Velocity of air at by-pass door No. 2, R. P. M. | 887 | .. |
| 27. Calculated volume dry air, 62° F., cubic feet per hour | 1,596,000 | 935,000 |

TEMPERATURES.

| | | |
|---|---|---|
| Date of tests | Dec. 23, 1913 | Dec. 24, 1913 |
| (Items 28 to 37 are for a period of 10.5 hours, while the fan was going.) | | |
| 28. Temperature air entering tempering heater, deg. F. | 78 | 45.4 |
| 24. Temperature air leaving tempering heater, deg. F. | 114 | 78 |
| 30. Temperature air at fan exit, deg. F. | 87.6 | 78 |
| 31. Temperature air leaving secondary heater No. 1, deg. F. | 140.5 | 139.5 |
| 32. Temperature air leaving secondary heater No. 2, deg. F. | 143 | 137.4 |
| 33. Temperature air in hot air tunnel, deg. F. | 129 | 123 |
| 34. Temperature air in tempered air tunnel, deg. F. | 87.6 | 78 |
| 35. Temperature air in front of furnaces, deg. F. | 79 | 77.4 |
| 36. Relative humidity, at tempering heater, per cent. | 28 | 62 |
| (Items 37 to 39 are averages for six hours of drafts on in morning.) | | |
| 37. Flue temperature outlet to tempering heater, deg. F. | 315 | 442 |
| 38. Flue temperature outlet to secondary heater No. 1, deg. F. | 316 | 437 |
| 39. Flue temperature outlet to secondary heater No. 2, deg. F. | 397 | 413 |
| (Items 40 and 41 are for whole 24 hours of test.) | | |
| 40. Average temperature inside building, deg. F. | 69 | 69 |
| 41. Average temperature outside building, deg. F. | 39 | 43 |

PRESSURES AND MISCELLANEOUS.

| | | |
|---|---|---|
| Date of tests | Dec. 23, 1913 | Dec. 24, 1913 |
| 42. Draft in main flue, inches water | 0.19 | 0.17 |
| 43. Fan suction below furnace room, inches water | 0.09 | 0.16 |
| 44. Barometric pressure, inches mercury | 29.75 | 29.80 |
| 45. Speed of fan, R. P. M. | 84 | 96 |
| 46. Current used by fan (watt meter) K. W. | 2 | 2 |

FUEL ANALYSIS (average of two samples).

| | | |
|---|---|---|
| 48. Moisture, per cent | 2.07 | 2.07 |
| 49. Volatile matter, per cent | 7.92 | 7.92 |
| 50. Fixed carbon, per cent | 73.89 | 73.89 |
| 51. Ash and ———, per cent | 16.12 | 16.12 |
| 52. Heating value by calorimeter as fired, B. T. U. | 11,780 | 11,780 |

| | | |
|---|---|---|
| FUEL GAS ANALYSIS (average for all heaters). | | |
| 53. Carbon dioxide, $CO_2$, per cent | 11 | 12 |
| 54. Oxygen, per cent | 9 | 8 |
| 55. Carbon monoxide CO, per cent | 0 | 0 |
| HEAT OUTPUT AND RATE OF COMBUSTION. | | |
| 56. Coal burned per hour, average for all heaters for 24 hours, pounds | 41.3 | 72.3 |
| 57. Coal burned per square foot of grate per hour, average for 24 hours, pounds | 0.96 | 1.69. |
| 58. Heat usefully employed, calculated, B. T. U. per hour | 403,000 | 705,000 |
| 59. Horse power of heaters, average for 24 hours | 12 | 21 |
| EFFICIENCY RESULTS. | | |
| 60. Horse power during six hours, drafts on | 28 | 62 |
| 61. Heat in coal fired, average for 24 hours (based on analysis; see items 51, 55), B. T. U. per hour | 485,000 | 850,000 |
| 62. Heat loss from building, calculated from glass, wall, allowing for ventilation, B. T. U. per hour | 403,000 | 705,000 |
| 63. Efficiency, based on heat loss from building, per cent | 83 | 83 |
| 64. Heat in coal fired, average for six hours with drafts on, B. T. U. per hour | 1,110,000 | 2,570,000 |
| 65. Heat losses due to stack, moisture, incomplete combustion, etc., average for six hours, B. T. U. per hour | 165,000 | 438,000 |
| 66. Efficiency, for six hours, calculated from combustion losses, per cent | 85 | 83 |

DISCUSSION OF THE EFFICIENCY RESULTS.

The figures of the last two lines point to the exceptionally high over-all efficiency of 83% for the heaters. It is proper to give close scrutiny to these results, in order to detect errors in methods used, if such exist. But it may be pointed out in advance that one feature of this installation is excellent in design, namely the placing of the heaters in the air chambers where the radiation from the setting is usefully employed in heating the air. The efficiency of the system can be determined from the assumed heat loss from the building, which can be calculated from known constants with reasonable accuracy, and the results obtained will serve as a check on other methods, at least. Following are the details of the building dimensions and constants used in the calculations:

| | | |
|---|---|---|
| BUILDING DIMENSIONS AND HEAT LOSS CALCULATIONS. | | |
| 67. Volume of building, cubic feet | 431,000 | |
| 68. Exposed glass surface, including skylights, square feet | 5,630 | |
| 69. Exposed wall surface, 24 in. thick, square feet | 3,724 | |
| 70. Exposed wall surface, 16 in. thick, square feet | 20,850 | |
| 71. Heat loss for glass assumed, B. T. U. per square foot per hour per degree difference | 1.03 | |
| 72. Heat loss for 24-in. wall, B. T. U. per square foot per hour per degree difference | 0.18 | |
| 73. Heat loss for 16-in. wall, B. T. U. per square foot per hour per degree difference | 0.24 | |
| Date of tests | Dec. 23, 1913 | Dec. 24, 1913 |
| 74. Air conditions at fan | Recirculating | Ventilating |
| 75. Average inside temperature for whole building, deg. F. | 69 | 69 |
| 76. Average outside temperature (Item 41) | 39 | 43 |
| 77. Ventilation; time during which air is assumed to make one complete change, hours | 4 | ½ |
| (Opening doors and windows is assumed to give some ventilation when recirculating on Dec. 23.) | | |
| 78. Heat loss due to glass, B. T. U. per hour | 174,000 | 151,000 |
| 79. Heat loss due to wall, total B. T. U. per hour | 170,000 | 147,000 |
| 80. Ventilation loss, B. T. U. per hour | 59,000 | 407,000 |
| 81. Total heat loss, B. T. U. per hour | 403,000 | 705,000 |

Item 81 is identical with item 61. These figures give an efficiency of 83% for both tests.

# Methods of Dripping Steam Mains

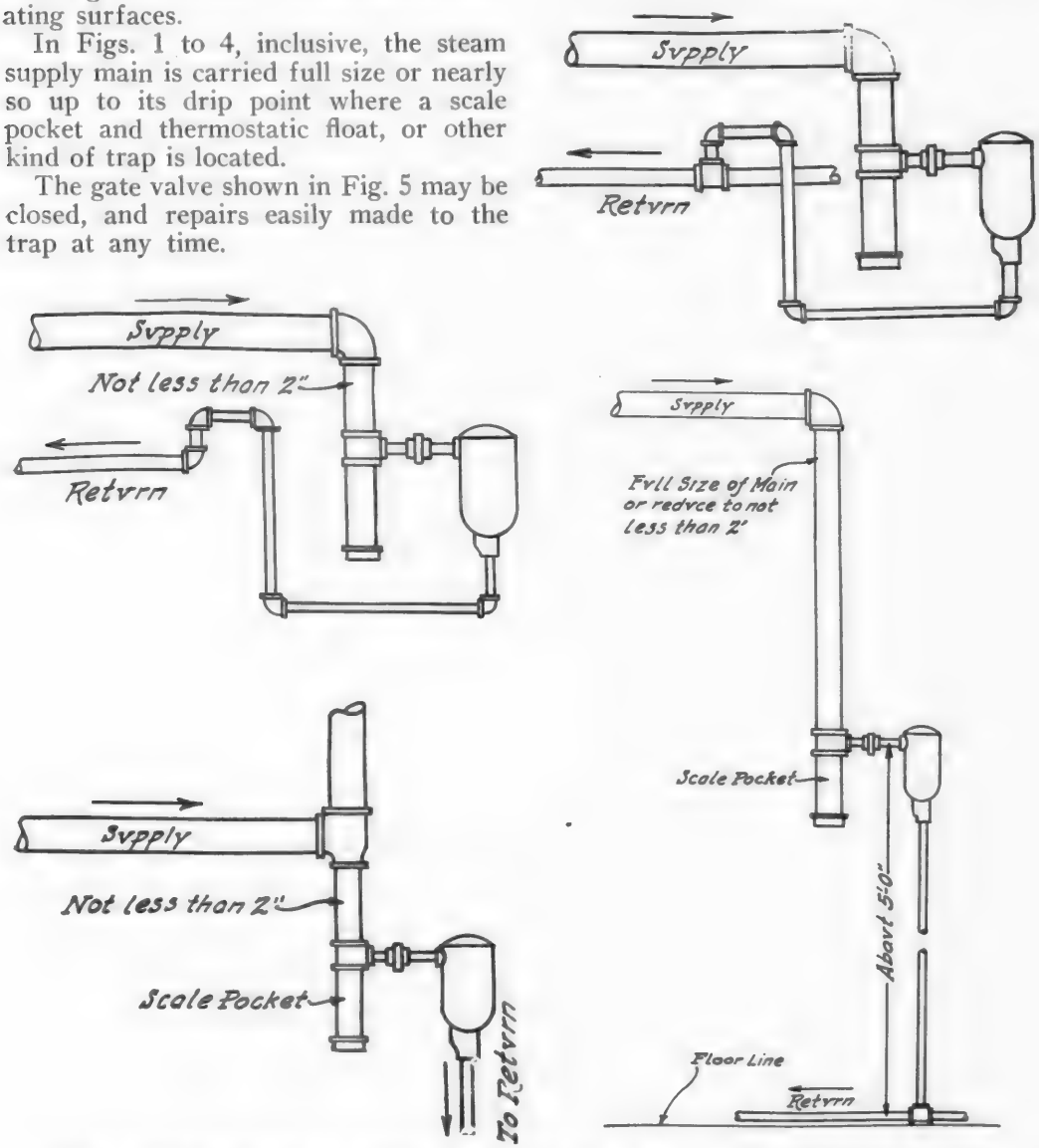
TOGETHER WITH ARRANGEMENT OF SCALE POCKETS AT RADIATING SURFACES TO SUIT VARYING CONDITIONS.

Various methods of dripping the ends or low points in steam mains are shown in Figs. 1 to 6, inclusive. Figs. 7 to 11, inclusive, show the methods adopted in obtaining scale pockets at the return ends of pipe coils and radiators. The particular method that is used is a matter of choice or as may be necessitated by the building construction or location of radiating surfaces.

In Figs. 1 to 4, inclusive, the steam supply main is carried full size or nearly so up to its drip point where a scale pocket and thermostatic float, or other kind of trap is located.

The gate valve shown in Fig. 5 may be closed, and repairs easily made to the trap at any time.

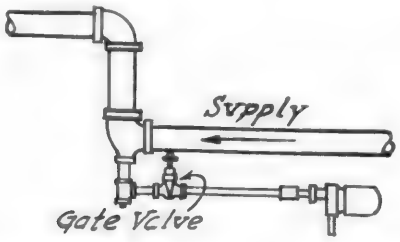
Fig. 6 shows a loop seal, and modifications of this are shown in Figs. 1 and 3. Loop seals may be unsightly in appearance when installed in offices or it may not be possible to obtain the proper depth of seal under some conditions. The further disadvantage of the loop seal is in its liability to stoppage. It is apt to

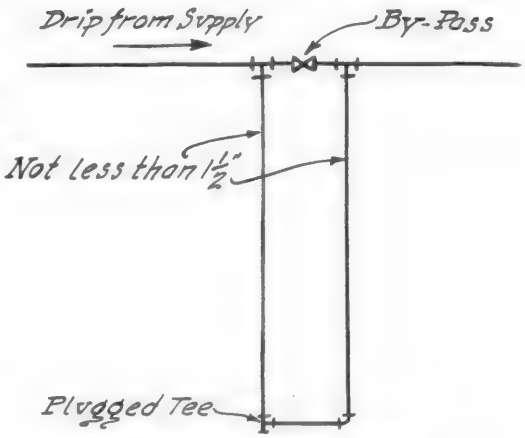



FIGS. 1-4—METHODS OF DRIPPING ENDS OR LOW POINTS IN STEAM MAINS.

freeze on exposed work, and only serves to increase the number of pipes and the maintenance.

The pipe forming the loop seal should be of liberal size and some provision made for draining the seal and cleaning out. A plugged tee or a nipple and cap may be used for this purpose. The depth of seal necessary is determined by the difference in pressure existing at that point, being about 2 ft. in depth for each pound difference in pressure.



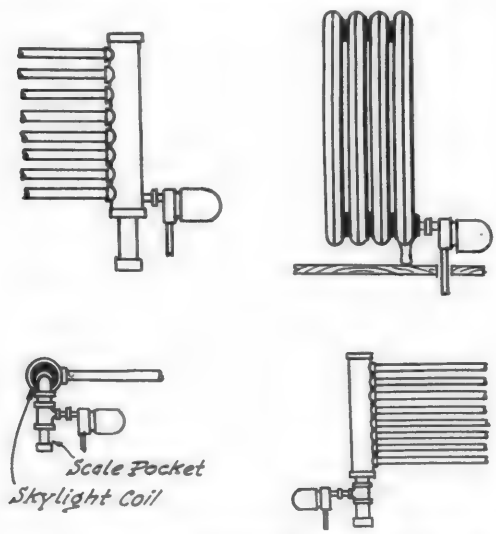

FIGS. 5-6—ADDITIONAL METHODS OF DRIPPING ENDS OR LOW POINTS IN STEAM MAINS.

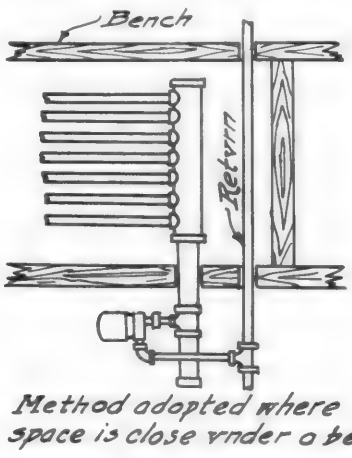
Loop seals are an advantage when the system is started up. As steam is turned on and enters the cold mains and branches it condenses rapidly and this first water of condensation is then quickly passed through the large areas afforded by the loop seals. In the event of stoppage the loop seal may be by-passed by opening the valve on the crossover above.

**Arrangements Adopted for Ventilating the New York Subway Extensions.**

In view of the agitation that arose over the ventilation of the New York subway when it was first opened and the evident necessity for better provisions for a proper air supply in the subway extensions, the following description, by F. Lavis, published in Engineering News for November 5, 1914, will be read with general interest.

Every effort has been made to so design the new subways, that the excessive heating which occurs at times in the summer in the present subway may be avoided. The tracks are to be divided so that trains going in one direction will be in a separate tube or tunnel from those going the opposite way; by this means it is expected




FIGS. 7-11—METHODS ADOPTED IN OBTAINING SCALE POCKETS AT RETURN ENDS OF PIPE COILS AND RADIATORS.

to utilize the movements of the trains (the so-called piston action where there is only one track in a single tube) to push the air ahead and out through the openings which are provided for this purpose.

The original subway is completely surrounded by an envelope of waterproofing, and it has been thought that this has prevented the dissipation of some of the heat generated by the motors, brakes, friction, etc., into the ground surrounding the structure. On the new lines waterproofing will generally only be used where actually necessary to keep out water, that is, below the ground-water line, in earth, and on the roof.

Openings in the roof of the tunnel, with sidewalk gratings, are provided over the station platforms, and generally one about half way between each station and one at each end of the stations on the side toward the approaching train, these latter being expected to take care of most of the draft caused by the train, instead of allowing it to create a current at the platform and up the stairways. The dimensions and numbers of these openings have been so fixed that it is expected that the current of air coming through the gratings in the sidewalk will be barely noticeable to pedestrians.

Fan chambers, which are all arranged so that they may be also used as emergency exits to the streets, are provided, one about midway between each station. They are so arranged that they will draw the air from the tunnel at points intermediate between the stations and blow it out through the gratings already described, thus, of course, drawing fresh air in at the stations. It is expected that the openings alone combined with the action of the trains will ordinarily provide sufficient ventilation, the fans being used only occasionally when circumstances require.

The piston action of the trains in the single-track tube of the Hudson & Manhattan R. R. has been noticeably efficacious in promoting efficient ventilation, but except on the Fourth Avenue, Brooklyn line, where there is a parked space in the center of the street and where walls are provided between each track, it was not considered practicable to divide all the tracks of the new four-track lines so that each would be in a separate tube, on account of the difficulty of providing outlets for the center tracks. It would be impractical, of course, to provide openings in the roadway of the streets, and in order that the openings in the sidewalks might be used, the center wall only was built dividing the traffic going in opposite directions, but leaving the two tracks on one side in the one space. If this does not produce the required movement of the air, that is, actual propelling movement, not mere stirring up as in the present subway, the fans must be utilized to supplement it. Openings about 2 ft. wide and 8 ft. high are provided at every 10 ft. in the center wall as a means of communication between the two sides, and as refuge niches, and these may tend to reduce the piston effect to some small extent.

Although this arrangement in the four-track section will reduce somewhat the positive piston action of the trains, it will be beneficial to the extent that it will tend to reduce the air resistance, which has been shown* to be by no means a negligible factor in cost of operation in single-track tubes, though this cost may be offset by the benefits of more efficient ventilation.

The actual effect of all these different items and of the size of the cross-section both on the efficiency of ventilation, as well as the cost of operation, is something of which little is actually known, but in view of the enormous expenditures which are being made and which undoubtedly will continue to be made in underground railways for rapid transit, in subaqueous tunnels, etc., it is hoped that further experiments along the lines of these already referred to and others of like nature may be continued.

The object of the design of the openings has been to provide at the track level a space into which the air pushed ahead of the train may expand and be detained, instead of being pushed by, and then provide an opening above through which it may escape to the surface, there being apparently little reason to doubt the efficacy of this proposed scheme.

## Current Heating and Ventilating Literature.

*Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from* THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

GAS FIRING—

Gas Fired Steam Boilers. H. E. G. Watson. Read before the Canadian Gas Association. On the use, management, care, etc., of such boilers. Ills. 3000 w. Am. Gas Ltg. Jour.—Oct. 19, 1914. 20c.

*J. V. Davies, "Air Resistance in Tube Tunnels," "Trans.," Am. Soc. C. E., Vol. LXXV, 1912.

BOILERS—

Down-Draft Heating Boilers. Osborn Monnett. Gives typical heating boilers and designs of furnace for smokeless operation, with tabulated results. Ills. 500 w. Power—Oct. 6, 1914. 20 c.

**Handy Data on Central Station Heating.**

Much of the work of the central station heating engineers is being simplified for him by the publication of tables similar to those given herewith, which are those used in the practice of J. C. Hornung, engineer, 111 West Monroe Street, Chicago, and published by him as a series of cards which are distributed to the trade.

Table No. 1, for instance, is a compilation of co-efficients as used by him for estimating direct radiation, together with his rule for ascertaining the radiation required with low pressure steam, with vapor or atmospheric steam and with hot water.

The other tables are devoted to the proper pipe sizes for various runs, etc., and these will be supplemented from time to time with additional tables.

In addition to the data contained on the cards, on the reverse of two of them are presented typical house installations arranged for service from a central heating station, one as designed for steam and the other for hot water.

**COEFFICIENTS FOR ESTIMATING DIRECT RADIATION**

| EXPOSURE | B.T.U. 1° DIF. | DIF. IN TEMP. BETWEEN ROOM & OUTSIDE 65° | 70° | 75° | 80° | 85° | 90° |
|---|---|---|---|---|---|---|---|
| Single Glass, Loose | 1.50 | 97.5 | 105.0 | 112.5 | 120.0 | 127.5 | 135.0 |
| " " Med | 1.35 | 87.8 | 94.5 | 101.3 | 108.0 | 114.8 | 121.5 |
| " " Tight | 1.20 | 78.0 | 84.0 | 90.0 | 96.0 | 102.0 | 108.0 |
| Double Glass, Storm | .60 | 39.0 | 42.0 | 45.0 | 48.0 | 51.0 | 54.0 |
| Vault Glass, Sidew'k | 1.50 | 97.5 | 105.0 | 112.5 | 120.0 | 127.5 | 135.0 |
| Single, Skylight | 1 08 | 70.2 | 75.6 | 81.0 | 86.4 | 91.8 | 97.2 |
| Double | .60 | 39.0 | 42.0 | 45.0 | 48.0 | 51.0 | 54.0 |
| Good Door, ½ Glass | 69 | 44.9 | 48.3 | 51.8 | 55.2 | 58.7 | 62.1 |
| " Solid | .48 | 31.2 | 33.6 | 36.0 | 38.4 | 40.8 | 43.2 |
| Poor Frame, N-W | .45 | 29.3 | 31.5 | 33.8 | 36.0 | 38.3 | 40.5 |
| Av'ge " N-W | .42 | 27.3 | 29.4 | 31.5 | 33.6 | 35.7 | 37.8 |
| Back Pl " N-W | .33 | 21.5 | 23.1 | 24.8 | 26.4 | 28.0 | 29 7 |
| 8" Brick" N-W | .39 | 25.4 | 27.3 | 29.3 | 31.2 | 33.2 | 35.1 |
| 12" " " N-W | .30 | 19.5 | 21.0 | 22.5 | 24.0 | 25.5 | 27.0 |
| 16" " " N-W | .24 | 15.6 | 16.8 | 18.0 | 19.2 | 20.4 | 21.6 |
| Ceiling, Fl. above | .30 | 19.5 | 21.0 | 22.5 | 24.0 | 25.5 | 27.0 |
| Floor, No Fl. below | 15 | 9.8 | 10.5 | 11.3 | 12.0 | 12.8 | 13.5 |
| Partition, Plastered | .20 | 13.0 | 14.0 | 15.0 | 16.0 | 17.0 | 18.0 |
| CUBIC SPACE | | | | | | | |
| ½ Change, per hour | 009 | .59 | :64 | .68 | .73 | .77 | .82 |
| 1 " " " " | .018 | 1.18 | 1.27 | 1.36 | 1.45 | 1.55 | 1.66 |
| 1½ " " " " | .027 | 1.77 | 1.91 | 2.05 | 2.18 | 2.32 | 2.45 |
| 2 " " " " | .036 | 2.36 | 2.55 | 2.73 | 2.91 | 3.09 | 3.27 |
| 2½ " " " " | .055 | 3.55 | 3.82 | 4.09 | 4.36 | 4.64 | 4.91 |
| 4 " " " " | .073 | 4.73 | 5.09 | 5.45 | 5.82 | 6.18 | 6.55 |

NOTE: Multiply Exposure or space by Coefficient corresponding to desired Dif. in Temp. and divide result by—

280 for Low Pressure Steam.
240 for Vapor or Atmospheric Steam.
170 for Hot Water—Temp. 180° at 0°.

COEFFICIENT TABLE FOR ESTIMATING DIRECT RADIATION.

**New Book.**

FUEL, SOLID, LIQUID and GASEOUS, is the title of a new book by J. S. S. Brame, F.C.S., instructor in chemistry at the Royal Naval College, England. The reading matter contained in the book is based upon a series of lectures delivered by the author at the Sir John Cass Technical Institute, at Aldgate. It is divided into four headings: solid fuel, liquid fuel, gaseous fuel and the analysis and calorimetry of fuels. In the last section are included also the question of purchase on a calorific basis and the scientific control of combustion. The author recommends the establishment of a

**PIPE SIZES FOR CENTRAL STATION HOT WATER SERVICES AND HOUSE EQUIPMENT**

DISTANCES GIVEN ARE IN LINEAL FT OF TWO PIPES ADD 10 FT FOR EACH PAIR OF ELLS OR EQUIVALENT

| Distance | RADIATION 40 | 80 | 120 | 160 | 200 | 240 | 280 | 320 | 400 | 480 | 560 | 640 | 720 | 800 | 900 | 1000 | 1250 | 1500 | 2000 | 2500 | 3000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1¼ | 1¼ | 1¼ | 1¼ | 1½ | 1½ | 2 | 2 | 2 | 2 | 2 |
| 40 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1¼ | 1¼ | 1¼ | 1½ | 1½ | 1½ | 2 | 2 | 2 | 2 | 2 | 2½ |
| 60 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1¼ | 1¼ | 1¼ | 1½ | 1½ | 1½ | 2 | 2 | 2 | 2 | 2 | 2½ | 2½ |
| 80 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1¼ | 1¼ | 1¼ | 1½ | 1½ | 1½ | 2 | 2 | 2 | 2 | 2 | 2½ | 2½ | 2½ |
| 100 | 1 | 1 | 1 | 1 | 1 | 1 | 1¼ | 1¼ | 1¼ | 1½ | 1½ | 1½ | 2 | 2 | 2 | 2 | 2 | 2½ | 2½ | 2½ | 3 |
| 120 | 1 | 1 | 1 | 1 | 1 | 1¼ | 1¼ | 1¼ | 1½ | 1½ | 1½ | 2 | 2 | 2 | 2 | 2 | 2½ | 2½ | 2½ | 3 | 3 |
| 140 | 1 | 1 | 1 | 1 | 1¼ | 1¼ | 1¼ | 1¼ | 1½ | 1½ | 2 | 2 | 2 | 2 | 2 | 2½ | 2½ | 2½ | 2½ | 3 | 3 |
| 160 | 1 | 1 | 1 | 1¼ | 1¼ | 1¼ | 1¼ | 1½ | 1½ | 2 | 2 | 2 | 2 | 2 | 2½ | 2½ | 2½ | 2½ | 3 | 3 | 3 |

## PIPE SIZES FOR CENTRAL STATION STEAM MAINS

RADIATION AT .3 LBS. STEAM PER HR. VELOCITIES IN FT. PER SEC.

| SIZE of LINE AND VELOCITY | 1/32" DROP PER 100 FT. | 1/16" DROP PER 100 FT. | 1/8" DROP PER 100 FT | 1/4" DROP PER 100 FT. | 3/8" DROP PER 100 FT | 1/2" DROP PER 100 FT. | 5/8" DROP PER 100 FT. | 3/4" DROP PER 100 FT | 7/8" DROP PER 100 FT. | 1" DROP PER 100 FT. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1" | 36 | 51 | 72 | 100 | 124 | 144 | 160 | 176 | 190 | 200 |
| VELOCITY | 11 | 15 | 22 | 30 | 37 | 43 | 48 | 53 | 57 | 60 |
| 2" | 236 | 334 | 507 | 719 | 877 | 1014 | 1135 | 1242 | 1343 | 1435 |
| VELOCITY | 18 | 25 | 38 | 54 | 66 | 76 | 85 | 93 | 100 | 108 |
| 3" | 709 | 998 | 1404 | 1993 | 2429 | 2829 | 3145 | 3440 | 3720 | 3920 |
| VELOCITY | 24 | 33 | 47 | 66 | 81 | 94 | 105 | 115 | 124 | 131 |
| 4" | 1561 | 2200 | 3113 | 4400 | 5385 | 6226 | 6973 | 7627 | 8249 | 8670 |
| VELOCITY | 30 | 42 | 58 | 84 | 102 | 118 | 132 | 145 | 157 | 165 |
| 5" | 2636 | 3701 | 5192 | 7313 | 8882 | 10384 | 11630 | 12720 | 13760 | 14600 |
| VELOCITY | 32 | 44 | 62 | 88 | 107 | 125 | 140 | 153 | 165 | 175 |
| 6" | 4146 | 5881 | 8315 | 11723 | 14495 | 16630 | 18625 | 20372 | 22035 | 23200 |
| VELOCITY | 35 | 49 | 69 | 97 | 120 | 139 | 155 | 170 | 184 | 193 |
| 8" | 8000 | 11295 | 16000 | 22560 | 27680 | 32000 | 35840 | 39200 | 42400 | 45200 |
| VELOCITY | 38 | 53 | 75 | 106 | 130 | 150 | 168 | 184 | 199 | 212 |
| 10" | 15328 | 21933 | 31000 | 43710 | 53630 | 62000 | 71440 | 75950 | 82150 | 87730 |
| VELOCITY | 47 | 66 | 93 | 131 | 161 | 182 | 214 | 228 | 246 | 263 |
| 12" | 24630 | 34790 | 49173 | 69334 | 85070 | 98346 | 110197 | 120473 | 130300 | 139160 |
| VELOCITY | 52 | 73 | 103 | 146 | 179 | 207 | 231 | 252 | 273 | 292 |
| 14" | 36450 | 51485 | 72420 | 102970 | 122350 | 145600 | 163100 | 178350 | 193450 | 205940 |
| VELOCITY | 56 | 79 | 110 | 158 | 187 | 223 | 249 | 274 | 295 | 315 |
| 16" | 50781 | 72360 | 102190 | 150240 | 177095 | 207515 | 240000 | 260000 | 280000 | 300000 |
| VELOCITY | 61 | 87 | 123 | 180 | 212 | 250 | 288 | 312 | 336 | 360 |

government fuel testing laboratory and pays a high tribute to the laboratories and work of the United States Bureau of Mines.

In the section on liquid fuel, its use for steam raising and heating purposes is considered and later particular attention is given to fuels for use in internal combustion engines. While the book is naturally written from the standpoint of English practice, the author shows his familiarity with American methods. In addition to the theoretical discussions there are many curves and tables showing analyses and the results obtained with different fuels and applications. Size 6 x 9 in. Pp. 372, with index. Price, $3.50 net. Published by Longsman, Green & Co., New York, or may be had through the book department of the Heating and Ventilating Magazine.

### Conoidal Fan Test.

In connection with the installation of a No. 17 Niagara Conoidal fan in the Cheney Bros.' Silk Mills, South Manchester, Conn., a carefully-conducated test, made during the week of November 16, showed a delivery of 45,000 cu. ft. of air per minute through the resistance of a humidifier, heating coils and ducts, with but 3 1/3 H. P., which included the bearing and belt losses. The Buffalo Forge Company, which manufactures this fan, states that it believes this comes very near to establishing a record.

## PIPE SIZES FOR CENTRAL STATION STEAM SERVICES AND HOUSE EQUIPMENT

DISTANCES GIVEN ARE IN LINEAL FEET OF PIPE. ADD 10 FT. FOR EACH ELL OR EQUIVALENT

| RADIATION | SERVICES | | | | | HOUSE EQUIPMENT. | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LENGTH OF RUN | | | | | BASEMENT RUNS SUPPLY | | | | RETURNS | | | | RISERS SUPPLY | | | RETURNS | | | RADIATOR CONNECTIONS |
| | 20 | 40 | 60 | 80 | 100 | 20 | 30 | 40 | 50 | 20 | 30 | 40 | 50 | 20 | 30 | 40 | 20 | 30 | 40 | Supply | Return |
| 25 | 1 | 1 | 1 | 1 | 1 | 3/4 | 3/4 | 3/4 | 3/4 | 1/2 | 1/2 | 1/2 | 1/2 | 3/4 | 3/4 | 3/4 | 1/2 | 1/2 | 1/2 | 3/4 | 1/2 |
| 50 | 1 | 1 | 1 | 1 | 1 | 3/4 | 3/4 | 1 | 1 | 1/2 | 1/2 | 1/2 | 1/2 | 3/4 | 3/4 | 3/4 | 1/2 | 1/2 | 1/2 | 3/4 | 1/2 |
| 75 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1/2 | 1/2 | 1/2 | 1/2 | 3/4 | 3/4 | 1 | 1/2 | 1/2 | 3/4 | 3/4 | 1/2 |
| 100 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1/2 | 1/2 | 1/2 | 1/2 | 1 | 1 | 1 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| 150 | 1 | 1 | 1 | 1 | 1 | 1 | 1 1/4 | 1 1/4 | 1 1/4 | 1/2 | 3/4 | 3/4 | 3/4 | 1 | 1 | 1 | 3/4 | 3/4 | 3/4 | 1 | 3/4 |
| 200 | 1 | 1 | 1 | 1 | 1 | 1 1/4 | 1 1/4 | 1 1/4 | 1 1/4 | 3/4 | 3/4 | 3/4 | 1 | 1 | 1 1/4 | 1 1/4 | 3/4 | 1 | 1 | 1 | 1 |
| 250 | 1 | 1 | 1 | 1 | 1 | 1 1/4 | 1 1/4 | 1 1/4 | 1 1/4 | 3/4 | 3/4 | 1 | 1 | 1 1/4 | 1 1/4 | 1 1/4 | 1 | 1 | 1 | 1 1/4 | 1 |
| 300 | 1 | 1 | 1 | 1 | 1 | 1 1/4 | 1 1/4 | 1 1/4 | 2 | 1 | 1 | 1 | 1 1/4 | 1 1/4 | 1 1/4 | 1 1/2 | 1 | 1 | 1 1/4 | 1 1/4 | 1 |
| 400 | 1 | 1 | 1 | 1 | 1 | 1 1/4 | 1 1/2 | 2 | 2 | 1 | 1 | 1 1/4 | 1 1/4 | 1 1/4 | 1 1/2 | 1 1/2 | 1 | 1 1/4 | 1 1/4 | | |
| 500 | 1 | 1 | 1 | 1 | 1 1/2 | 1 1/2 | 2 | 2 | 2 | 1 | 1 1/4 | 1 1/4 | 1 1/2 | 1 1/2 | 1 1/2 | 2 | 1 1/4 | 1 1/2 | 1 1/2 | | |
| 750 | 1 | 1 | 1 | 1 1/2 | 1 1/2 | 2 | 2 | 2 | 2 1/2 | 1 1/4 | 1 1/4 | 1 1/2 | 1 1/2 | 1 1/2 | 2 | 2 | 1 1/4 | 1 1/2 | 1 1/2 | | |
| 1000 | 1 | 1 | 1 1/2 | 1 1/2 | 2 | 2 | 2 1/2 | 2 1/2 | 2 1/2 | 1 1/2 | 1 1/2 | 1 1/2 | 1 1/2 | 2 | 2 | 2 1/2 | 1 1/2 | 1 1/2 | 1 1/2 | | |
| 1500 | 1 | 1 1/2 | 1 1/2 | 2 | 2 | 2 1/2 | 2 1/2 | 3 | 3 | 1 1/2 | 1 1/2 | 1 1/2 | 1 1/2 | 2 | 2 1/2 | 2 1/2 | 1 1/2 | 1 1/2 | 1 1/2 | | |
| 2000 | 1 1/2 | 1 1/2 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 1 1/2 | 1 1/2 | 1 1/2 | 2 | 2 1/2 | 2 1/2 | 3 | 1 1/2 | 1 1/2 | 2 | | |
| 2500 | 1 1/2 | 2 | 2 | 2 | 2 | 3 | 4 | 4 | 4 | 1 1/2 | 2 | 2 | 2 | 2 1/2 | 3 | 3 | 1 1/2 | 2 | 2 | | |
| 3000 | 2 | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 2 | 2 | 2 1/2 | | |
| 4000 | 2 | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 5 | 2 | 2 | 2 | 2 1/2 | 3 | 4 | 4 | 2 | 2 1/2 | 2 1/2 | | |
| 5000 | 2 | 2 | 2 | 2 | 2 | 4 | 4 | 5 | 5 | 2 | 2 | 2 1/2 | 2 1/2 | 4 | 4 | 4 | 2 1/2 | 2 1/2 | 2 1/2 | | |

THE HEATING AND VENTILATING MAGAZINE

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IT WILL be a relief to the general public and a vindication of the arguments of ventilating engineers to know that the extensions of the New York Subway, now under construction, will be ventilated in accordance with the most approved practice for this type of structure. That is, the tracks are to be divided so that trains going in one direction will be in a separate tube or tunnel from those going the opposite way. By this means it is expected to utilize the movements of the trains through the so-called piston action to push the air ahead and out through openings that will be provided for the purpose. This will not apply to each of the four tracks of the new system, on account of the difficulty of providing outlets for the center tracks, but the center wall will divide the traffic going in opposite directions.

In addition to this, fan chambers will be provided, one between each station, arranged to draw air from the tunnel at points intermediate between the stations and blow it out through gratings at the level of the sidewalk.

Another arrangement that will be an improvement over the original New York subway construction will be the use of waterproofing only where necessary, so that as much of the heat as possible gen erated in the tunnel may be dissipated into the ground surrounding the structure. The original subway is completely surrounded by an envelope of waterproofing which serves as an effective heat insulator.

The size of the fan installation will be a notable item in the trade since two fans will be included in each fan chamber and the number of fan chambers, corresponding to that of the stations, will amount to one hundred or more, making the complete installation above two hundred fans.

A PRACTICAL demonstration of the co-operation that may be obtained between the engineering schools and the mechanical profession is to be seen in the publication of a heating system test conducted by Prof. E. H. Lockwood, of the Sheffield Scientific School of Yale University. This test, which is reported on another page, is but one of a number that are under way or arranged for, at that institution, of apparatus used in heating and ventilating work. Moreover the various engineering institutions are showing an increased interest both in making such tests and in obtaining from the trade the valuable constructive criticism that will place both the methods used and the results obtained on a practical basis.

WE are pleased to announce the publication, commencing with the January issue, of a series of articles on "District Heating" by S. Morgan Bushnell, of Chicago, the well-known central heating engineer.

# THE CONSULTING ENGINEER

*The Consulting Engineer" is prepared to reply, in this department, to any questions which our readers may ask regarding problems connected with the design and installation of mechanical equipments of buildings.*

Conducted by IRA N. EVANS.

### 40—Data on Smoke-Stacks.

QUESTION: Kindly give me the boiler horsepower that a steel stack will carry 175 ft. above boiler-room floor, and of cross-section area as shown by sketch. This stack is built in the building with only

CROSS SECTION OF SMOKE STACK.

the upper 20 ft. exposed. The breeching will have a direct run of 45 ft. A cheap grade of coal will likely be used in return tubular boilers, with Jones' stokers.

ANSWER: In the design of chimneys the effective height is the distance from the boiler grate to the top, or about 170 ft., in your case. The effective area is the area enclosed by a line drawn around the periphery of the chimney 2 in. from the side, that amount being deducted for friction. The gross area of the stack is $(1.25 \text{ ft.})^2 \pi + (1 \text{ ft.} \times 2.5 \text{ ft.}) = 7.4$ sq. ft. The effective area will be $(1.0833)^2 \pi + (1 \text{ ft.} \times 2\ 1/6 \text{ ft.}) = 5.85$ sq. ft. With a consumption of 5 lbs. of coal per horsepower hour the horsepower will be H.P. $= 3.33 \times 5.85 \sqrt{h}$ or 170 ft. H.P. = 253.5 and 253.5 x 5 = 1267.5 lbs. coal per hour.

The height has to do with the power or intensity of the draft. If you use stokers and forced draft, as well as the chimney, this height should be sufficient. If more is required, multiply the height by 0.007 and it will be the draft in inches of water. 170 ft. x 0.007 = 1.19 or 1.2 in. of water.

Increasing the area of above flue does not increase the draft intensity and a high intensity is of comparative little help if the chimney is too small. Of course, it will help some, but the higher velocity is almost neutralized by friction.

The data used in the foregoing discussion will be found in Kent's Handbook, and also in Babcock & Wilcox's Handbook on Steam.

The true formula for draft intensity is $D = h [(7.6 - Ta) - (7.9 - Tc)]$ in which Ta and Tc are the absolute temperature or the thermometric temperature + 460° F. d is the draft in inches of water and h, the effective height of the chimney.

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### 41—Selection of Pump for Hot Water Heating.

QUESTION: Will you kindly advise me as to the style of water end you would recommend for a low steam pressure duplex pump for forced circulation hot water heating? The pump must handle 300 gals. per minute against a 15 lb. friction head.

ANSWER: In the first place, a duplex pump is about the noisiest piece of apparatus that can be used for this class of service, even under favorable conditions. The noise of the metal valves can be heard to the farthest limits of the piping, except when the pump is running very slowly. This is due to the balanced water pressure on either side of the pump. Rubber valves are generally used only on cold water service. An air chamber will help, but not entirely remedy the trouble. Whether the piston or plunger type of pump is used does not matter, although the service would favor the piston type on account of possible air in the circulated water.

The steam pressure is stated as low, but not how low. If the pump were operating at speed and delivering the quantity of water called for, with piston for steam twice the area of the water piston, the steam pressure required initial would be about 30 lbs., with a steam consumption all out of proportion to the work required, even if the exhaust were utilized. This would give a mean effective steam pressure about the same as the water resistance, or about 15 lbs. These figures are approximate and intended only to convey an idea of the pump that would result.

A rotary pump or centrifugal is the only type of pump for this service. No prime mover will work satisfactorily on very low steam pressures whether of piston or rotary type. Of course, theoretically, if the piston is large, a very low pressure may be used, but the friction and size of cylinder practically nullify this advantage on very low pressures and steam has to be carried full stroke, with

corresponding increased steam consumption. If it is possible, the centrifugal or rotary pump should be used and if sufficient steam pressure is not available, electric motor and pump should be installed where current can be obtained at anywhere near reasonable rates.

If the steam pressure were below 10 lbs., it would be correspondingly worse. If 30 lbs. is required, it might as well be 50, 60 or 80 lbs. and a standard type of machine could be used which would give satisfaction.

In most plants a greater amount of money is spent for special machinery to operate on extremely low pressures, with a corresponding sacrifice in economical operation, than would be required to operate the plant on higher pressures and employ experienced help, at a higher price to handle the fuel. A greater amount of fuel is required in the former case and the more efficient labor would easily save the difference, especially if there were any considerable difference in price between steam and domestic coals and the plant were of any appreciable size.

### New Dates for Heating Engineers' Meeting.

Announcement is made that the annual meeting of the American Society of Heating and Ventilating Engineers will be held January 20-22, 1915. This means that the annual meeting will extend from Wednesday to Friday, instead of concluding Thursday afternoon, as in former years. In order to comply with the conditions of the constitution, a formal meeting will be called for Tuesday, January 19, which will be immediately adjourned to the following day. One of the advantages of the new dates is that visiting members will thus find it more convenient to spend the week-end in the metropolis and if this is found to be generally acted upon, it is likely that the constitution will be amended providing for a Wednesday-to-Friday meeting.

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### New York Chapter Hears Report on Tests of Air Tube Heaters.

A two-day test of the Harrison air tube heater installation at the Ives Memorial Library, in New Haven, Conn., and a discussion of the new heat unit proposed for use in connection with warm air furnace heating were the features of the November meeting of the New York Chapter, held at the Engineering Societies Building, November 16.

The air tube heater test was described by Prof. E. H. Lockwood, assistant professor of engineering at the Sheffield Scientific School, Yale University, under whose direct supervision the test was made. The discussion on furnace heating was opened by Roy E. Lynd, of the Richardson & Boynton Co.

Prof. Lockwood's address was illustrated by lantern slides showing the air tube heater equipment, consisting of a battery of two heaters for tempering the air and three additional heaters for reheating the air. He showed by slides how the air, after leaving the heaters, passed through a central brick duct running down the center of the building and divided horizontally into tempered and hot air ducts, the air passing thence to vertical flues with mixing dampers placed at the base of the flues. (A detailed description of this equipment was published in THE HEATING AND VENTILATING MAGAZINE for January, 1910.)

One of the most interesting points brought out by Prof. Lockwood was in connection with the discrepancy between the amount of the heat supplied to the building during the six hours the heaters were in operation and that actually utilized in the various rooms to maintain the desired temperature. This discrepancy, he said, amounted to approximately 3,500,000 B. T. U. and he gave it as his opinion that this heat was absorbed by the large brick tunnel in the basement which served as the plenum chamber. This theory was confirmed by the fact that when the heaters were checked the amount of heat supplied to the rooms was sufficient to maintain the temperature at 70° and that during the night, when the heaters were banked, the temperature in the library seldom fell below 60°.

Mr. Davis expressed the opinion that this heat loss might have been due to window air leakage and brought out the fact that while a coefficient of 1.03, as commonly used, is correct for the ordinary heat loss through windows, this factor would become 1.22 with a wind velocity of 4 miles per hour and might go as high as 2.79 with a 40-mile wind. He said that the standard factor for a window on the exposed side of a building is 110 for a 70° range.

President Timmis made the point that the effect of cold air blowing across a window surface would have a considerable effect on the heat loss. irrespective of the air leakage.

Mr. Lynd's talk was devoted to a new method of designing furnace installations which, he showed, is based upon the "Richardson heat unit." The speaker said that the

principal shortcomings of the method heretofore used in the design of furnace heating systems has been the lack of some definite unit by which the heat losses from buildings, the carrying capacities of pipes, and the heating capacity of furnaces could be measured. The use of the B. T. U., he thought, was a little too involved for the average furnace heating contractor. What we should have, he said, is a unit which would be easier to handle in connection with furnace work, just as the square feet of radiation is almost invariably used in steam and hot water heating. Figuring heat losses on the basis of cubical contents alone he considered rather a hazardous proposition and the selection of pipe sizes and furnace sizes has always been more or less a matter of guesswork.

The speaker then referred to the new "Richardson heat unit," which, he stated, is the heating value of 1 sq. in. of cross-sectional first floor pipe area when the air leaving the register has a temperature of 140° F. and a velocity of 240 ft. per minute. The available heat value of the "Richardson heat unit" is 110 B. T. U. per hour.

The most casual inspection, he said, will show the analogy between this unit as applied to furnace work and the square feet of radiation as applied to steam and hot water work.

Having established the value of this new unit, he showed how it is a simple matter to change any of the accepted rules for figuring heat losses in terms of B. T. U. into similar rules in terms of the new unit. The speaker referred frequently to the Richardson Manual of Warm Air Heating, recently published by the Richardson & Boynton Co., New York, which takes up the "Richardson heat unit" in detail, showing its application in the designing of any type of warm air furnace system.

In addition to the technical programme, a report was received from the chapter's professional efficiency and welfare committee, through Perry West, chairman, which is at work on what will practically amount to a code of ethics for the engineer. In the preliminary report the specific subjects which the committee proposes to take up are stated to be (1) standards of membership and the requirement of a legal license; (2) the attitude of those who employ engineers, including data on what percentage of engineering work is being handled by engineers; (3) compensation for engineering work and prevailing fees; (4) economy of design; (5) engineering responsibility; (6) separation of engineering from other contracts; and (7) co-operation of other associations.

### Illinois Chapter.

Members of the Illinois Chapter met at the Great Northern Hotel in Chicago, November 9, where, after a chapter dinner, they held a professional session. The topic for the evening was on the actual operation and experiences with the accepted types of smokeless furnaces for heating purposes, with special reference to the down-draft type. About twenty members were in attendance.

### Massachusetts Chapter.

The rules formulated by the Massachusetts District Police for the inspection of boilers were under discussion at the November meeting of the Massachusetts Chapter, held at the Revere House, Boston, November 11. In the absence of the president and vice-president, J. W. H. Myrick presided. It was voted to continue the discussion at the next meeting and to invite Mayor Curley and Building Inspector to be present and speak. The December topic was announced as "A New System in Schoolhouse Ventilation."

### A Proposed Missouri Chapter.

A movement is on foot to organize a Missouri Chapter, with headquarters in St. Louis. The society has at present some 20 members in St. Louis and it is anticipated that this number could be materially increased through the formation of a local chapter at that point.

### Institution of Heating and Ventilating Engineers.

A lecture by A. H. Barker on "Some Possible Future Developments in Ventilation," was the principal item on the programme for the autumn meeting of the Institution (British) of Heating and Ventilating Engineers, which was held in London, October 13. H. H. Grundy was elected president of the Institution for the ensuing year. It was decided to hold the winter meeting February 9, 1915, the summer meeting. June 22, 1915, and the next autumn meeting, October 12, 1915.

Some idea of the research work being undertaken in England relating to heating and ventilation was given by Mr. Barker, who is conducting a series of elaborate experiments at the University College, in London.

"During the past year," he said, "I have designed, and had made, quite a large amount of plant and instruments for carrying out work which we have in view for this and future sessions. It has seemed to me that that aspect of the heating profession, which is of the greatest importance at the present time, is the relation between

the radiant heat and the air heat produced by different methods of heating and different proportions between radiated surface and exposure factor. This is a very wide subject which has been hardly touched. So far as I am aware, there is no information available on this matter at all, and it is practically virgin soil.

"I have designed a number of instruments for investigating it thoroughly, some of which I explained in a paper read to the Institution during last year, and I exhibited the apparatus itself during the lecture on October 13 at the College. With this apparatus we intend during the present session to tackle the whole problem, in the effort to arrive at some figures and some definite information regarding it.

"Another chief branch of the research work which will be carried out during this year, if we can get enough students to take an interest in it, will be in connection with ventilation matters pure and simple. We intend to investigate and verify, so far as is possible, the co-efficients which are in common use and which were determined by Rietschel at Charlottenburg several years ago. In this connection there is a mass of German literature to translate which has some bearing on the matter, and some of which I think should be published for the benefit of English readers.

"We have erected an apparatus for standardizing air resistances and measuring those resistances on the lines of the electrical Wheatstone bridge. I think this investigation promises well, but I shall be in a better position in six months' time to say something about it.

"Mr. Pearson has very kindly given us a boiler and a set of radiators with which I have erected an apparatus especially designed to exhibit the variations in the rate of flow of water in pipes and the bearing which this difficult problem has on the relative pressures througout a hot water apparatus. We hope this plant will be most instructive, and will enable rules for pipe sizing to be established by experiment. The theory on which this is based is one of my own. It is set out in my book. There is no apparatus in existence on which it can be verified except this, so far as I know.

"We have erected also a beautiful plant for determining the amount of heat emitted as radiation by radiators and by gas-fires, electrical-fires and coal-fires. We have had made an apparatus for determining the proportion of dust particles in a sample of air, and for determining the velocity and movements of air in all parts of a room. We have also erected a plant for testing the effect of various quantities and conditions of air on human beings; also a plant for calibrating the micro-anemometer which I have designed and had made during the session.

"We have also designed and erected a plant for measuring with great accuracy the value of non-conducting compositions.

"We have erected a complete plant for the investigation of friction of air in pipes."

# LEGAL DECISIONS

**Agreement to Furnish Steam—Construction.**

A provision of a lease of laundry premises provided that the lessor should furnish without charge "live steam pressure through a 1-in. pipe as constructed from the boiler room at the present time." In injunction proceedings by the lessee to restrain the lessor from cutting off the steam, it was held that this did not preclude the lessor from removing the existing 1½-in. pipe and replacing it by a 1-in. pipe, in the absence of fraud, accident, or mistake in the execution of the lease. The lease was silent as to the pressure to be maintained. Evidence to show how much steam was being furnished when the lease was made, and how much the defendant continued to furnish thereafter was held to be admissible to show the intent of the contracting parties. The lessee was entitled to receive a live steam pressure through a 1-in. pipe, in amount sufficient to meet the reasonable requirements of his business and increases consequent on the installation of additional machinery, as contemplated by the contracting parties.—Bauer vs. Byrd, Pennsylvania Supreme Court, 91 Atl. 847.

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**Warranties—Evidence—Counterclaims—Burden of Proof.**

A contract for the installation of a heating and ventilating system in a schoolhouse contained the guaranty that the system would, with proper care in operation, heat the schoolroom to 70° F. during the coldest weather and provide good ventilation during school hours. Under this contract a heater was installed which was accepted as being satisfactory. The heater was afterwards used to some extent during the winter of 1912-13. Under a claim that it did not operate satisfactorily, the school district refused to pay therefor, and the contractor brought suit. The defendant counterclaimed for $300 as damages for a breach of the warranty. The defendant recovered a verdict of $75. The plaintiff appealed.

On appeal it was held that, as it was the contention of the plaintiff that the heater had not been properly operated, evidence was admissible that other apparatus, similar in character to the one which the plaintiff had sold to the defendant, when properly operated, satisfactorily heated the buildings in which they were installed. It was also held that in a case like this, where the heating system contracted for was delivered by the plaintiff and accepted by the defendant as in accordance with the contract and warranty, and the defendant relied upon an affirmative defense, the burden of proof rested upon the defendant to establish the defense relied upon —in this case a breach of the warranty as to what the furnace would do under proper care in operation. The judgment was reversed, and a new trial ordered.—Waterman-Waterbury Co. vs. School Dist. No. 2, Michigan Supreme Court, 148 N. W. 673.

**Substantial Compliance with Contract.**

Suit was brought upon an oral contract, for the price of $380, for furnishing all the material and doing all the work in installing in the building of the defendant a heating plant, consisting of boiler, radiators, pipes, etc., complete. The defense was that the plaintiff's contract required him to furnish a Cambria boiler, with all necessary piping, radiators, etc., and install it in the defendants' building, and that the plaintiff guaranteed the plant to propertly heat the building; that the plaintiff set up a Simplicity boiler instead of Cambria heater and that the defendant did not consent to this change of heaters, and that having made the change on his own motion, the plaintiff's guaranty extended to the Simplicity heater in all respects as it was originally made in regard to the Cambria. At the trial the plaintiff offered evidence tending to prove that the defendant had authorized and ordered the installation of the Simplicity heater at his own risk on the guaranty of the manufacturers of that furnace. The defendant then shifted his ground by admitting that the heater was probably all right, but that the rest of the heating system was not properly installed. He contended that there was something wrong with the connections so that the system would not heat the building, and therefore the plaintiff had not substantially complied with his contract and was not entitled to recover any part of the $380.

The plaintiff offered considerable testimony tending to show a substantial compliance with his contract. It was therefore held that the main questions were of fact and were for the jury. If there was an honest, substantial compliance with the contract, with minor defects which could be readily supplied, the plaintiff could recover and the jury would make a deduction of such an amount as would remedy the defects. But if there was not an honest, substantial compliance with the contract the plaintiff could not recover at all. The jury found for the amount of the contract price, with interest less an allowance of $45 for making changes.—Kull vs. Middleman, 51 Pennsylvania Superior Court, 137.

**Operating Heating Systems Under a Partial Vacuum.**

The question is often asked, is it possible to operate a steam heating apparatus under a partial vacuum?

It is quite difficult to do so successfully and practically impossible to operate under the degree of vacuum that should be maintained to produce the proper results. Assume an outside temperature of 20° F. For this condition the amount of vacuum that should be carried on the radiators to prevent overheating is 16½ in., a condition which it is practically impossible to maintain, as before remarked.

Example: Steam at a temperature of 220° F., room 70° F. Radiation installed, 100 sq. ft. of pipe coil assumed as necessary to heat the room to 70° with an outside temperature of zero.

220 — 70 = 150° F. temperature difference.

2 B. T. U. per square foot of pipe coil per degree difference in temperature.

2 × 150 × 100 sq. ft. = 30,000 B. T. U. transmitted and then lost through exposed surfaces of building construction and by air change.

30,000 B. T. U. ÷ 70 = 428.6 B. T. U. lost per degree temperature difference.

70 — 20 = 50° F. temperature difference.

428.6 × 50 = 21,430 B. T. U. required with an outside temperature of 20°.

21,430 ÷ 100 sq. ft. = 214 B. T. U. to be transmitted per square foot per hour.

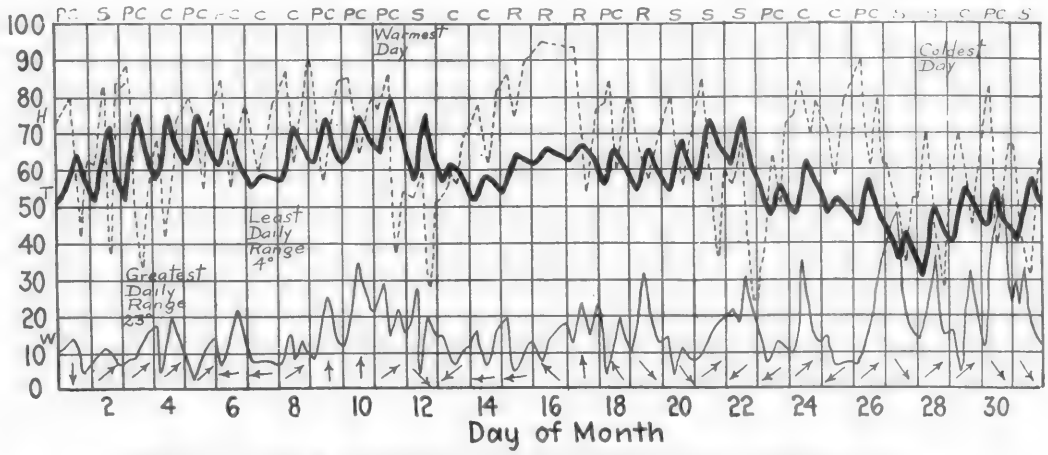
214 ÷ 2 B. T. U. = 107° temperature difference required between steam and room.

107 + 70 = 177° required temperature of the steam, which is the temperature of steam at 16½ in. of vacuum.

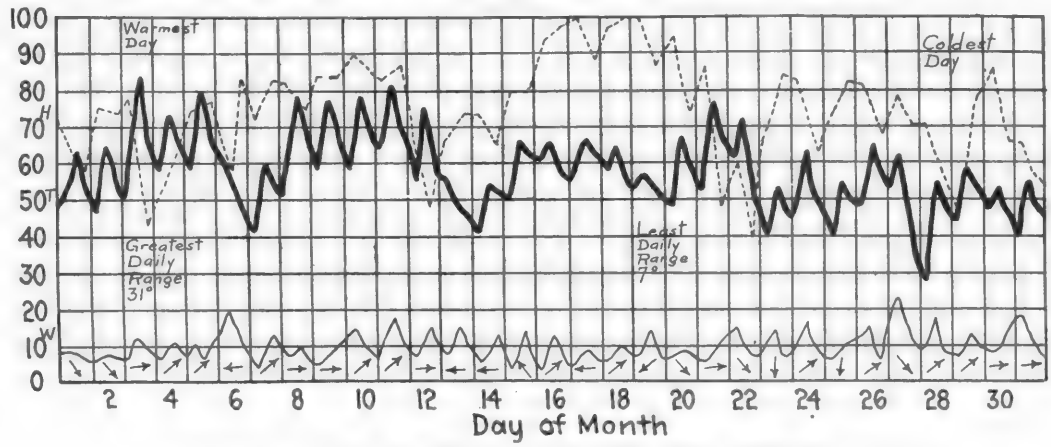
P. A. Hoffman, formerly with Evans, Almirall & Co., New York, has been appointed a sales engineer for the W. G. Cornell Co., New York, heating, ventilating and plumbing engineers and contractors.

## The Weather for October, 1914

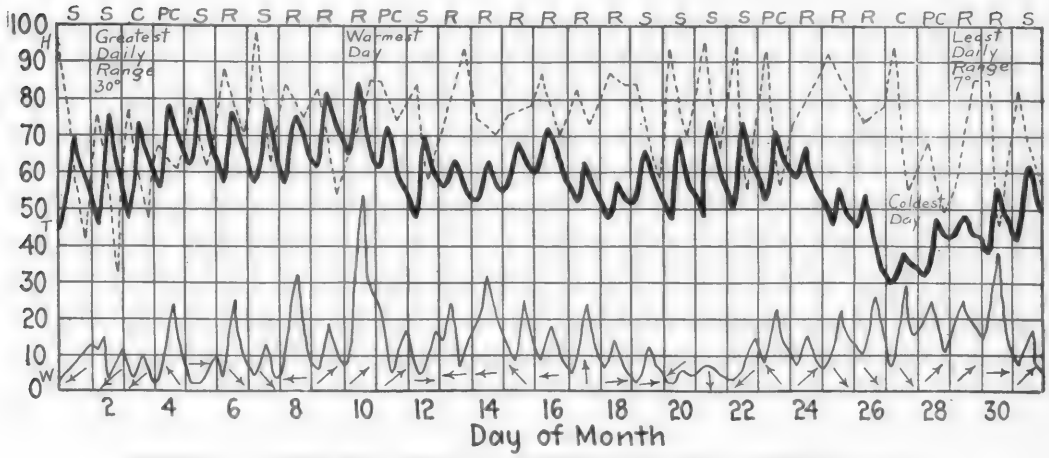
| | New York | Boston | Pittsburgh | Chicago | St. Louis |
|---|---|---|---|---|---|
| Highest temperature, degrees F. | 80 | 83 | 84 | 81 | 82 |
| Date of highest temperature | 11 | 3 | 10 | 7 | 6 |
| Lowest temperature, degrees F. | 31 | 29 | 30 | 28 | 31 |
| Date of lowest temperature | 28 | 28 | 27 | 27 | 27 |
| Greatest daily range, degrees F. | 23 | 31 | 30 | 24 | 26 |
| Date of greatest daily range | 3 | 3 | 2 | 31 | 28 |
| Least daily range, degrees F. | 4 | 7 | 7 | 4 | 5 |
| Date of least daily range | 7 | 19 | 29 | 14 | 13 |
| Mean temperature for month, degrees F. | 59 | 57 | 58 | 59.4 | 60.8 |
| Normal mean temp. for month, deg. F. | 55.6 | 52.3 | 54.9 | 53.2 | 58.4 |
| Total rainfall, inches | 1.92 | 1.54 | 3.07 | 2.89 | 7.45 |
| Total snowfall, inches | .. | Trace | Trace | Trace | .. |
| Normal precipitation, this month, in. | 3.71 | 3.86 | 2.36 | 2.55 | 2.41 |
| Total wind movement, miles | 10814 | 6766 | 7165 | 7810 | 7599 |
| Average hourly wind velocity, miles | 14.5 | 9.1 | 9.6 | 10.5 | 10.2 |
| Prevailing direction of wind | S.W. | S.W. | W. | S.W. | S. |
| Number of clear days | 8 | 15 | 11 | 14 | 12 |
| Number of partly cloudy days | 11 | 7 | 9 | 5 | 9 |
| Number of cloudy days | 12 | 9 | 11 | 12 | 10 |
| Number of days on which rain fell | 5 | 5 | 15 | 14 | 7 |
| Number of days on which snow fell | .. | .. | .. | .. | .. |
| Snow on ground at end of month, in. | .. | .. | .. | .. | .. |



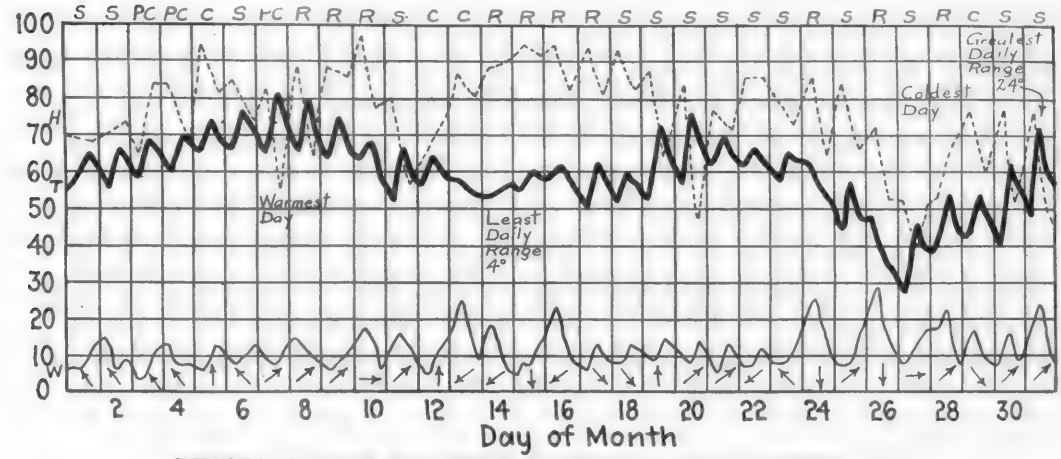

RECORD OF THE WEATHER IN NEW YORK FOR OCTOBER, 1914.



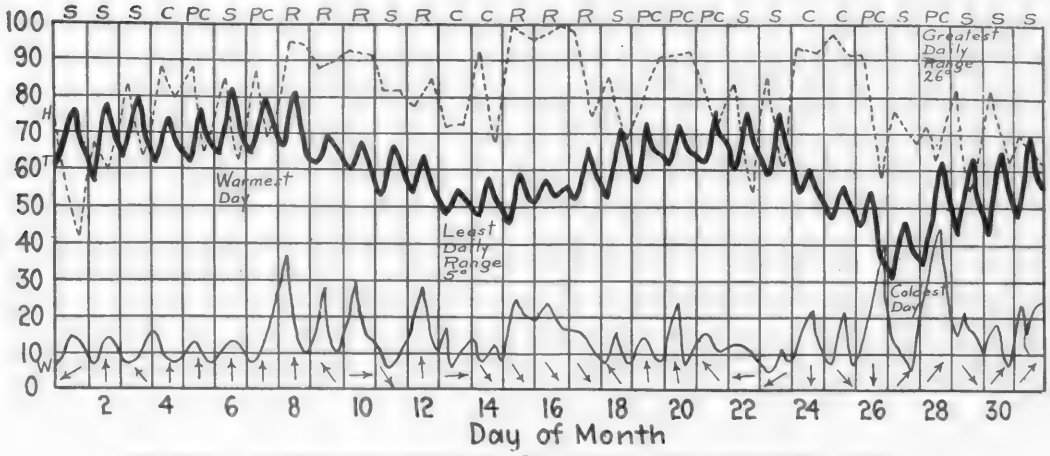

RECORD OF THE WEATHER IN BOSTON FOR OCTOBER, 1914.




RECORD OF THE WEATHER IN PITTSBURGH FOR OCTOBER, 1914.




RECORD OF THE WEATHER IN CHICAGO FOR OCTOBER, 1914.




RECORD OF THE WEATHER IN ST. LOUIS FOR OCTOBER, 1914.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in percentage from readings taken at 8 A. M. and 8 P. M.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

### Extensive Ventilation Experiments Arranged by New York Ventilation Commission.

An elaborate series of tests extending over a period of two years will shortly be undertaken upon 60 or more school children of the Bronx, New York, by the New York State Commission on Ventilation, with a view of solving the problem of efficient ventilation for the city's schools.

As previously reported, preliminary experiments have been going on for the last nine months in a specially-constructed experimental chamber at the City College. Five volunteer students from the college have been subjected daily to varying temperatures and states of humidity, as well as to different methods of ventilation, and the work that they were able to accomplish under these conditions has been carefully noted. With the knowledge gained in this way the commission is now ready to transfer its investigations to the school children.

The tests will be made in Public School 51, soon to be opened in the Bronx. The new building, one of the finest in the city, will contain two classrooms fitted with every conceivable ventilating appliance as well as an elaborate plant for furnishing whatever changes in temperature and air the investigators may desire. Each room will have double ceilings, walls, and floors, in order to provide inlets and outlets for air at any point, but aside from this special mechanical equipment, the rooms will differ in no way from the other classrooms in the building. There will be seats for about thirty children in each, and the youngsters will be kept at their regular classroom work without disturbance. Probably they will not even be aware that they are being made the subjects of scientific tests, although there will not be a minute of the day they will not be under observation.

#### PSYCHOLOGICAL TESTS ALSO

Members of the commission will make periodic visits to the school, and regular physical examinations will be made to determine the effect of the tests upon the children's health. Psychological tests will also be made to determine the mental efficiency of the youngsters, and the teachers will also be expected to note what effects the tests have upon the class work.

The commission will keep one representative in constant charge of the school plant. This part of the work will be left to Butler P. Crittenden, assistant engineer in charge of the experiments at City College. The members of the commission, all of whom serve without pay, are Prof. C. E. A. Winslow, College of the City of New York, chairman; Prof. E. L. Thorndyke, psychologist of Teachers' College; Dr. Frederick S. Lee, physiologist of the College of Physicians and Surgeons; D. D. Kimball, engineer; Dr. James Alexander Miller, a physician, and Prof. E. B. Phelps, chemist in the Hygiene Laboratory of the Government Health Service, Washington, D. C.

In discussing the forthcoming tests, Prof. Winslow said:

"Our tests at Public School 51 will put into practice some of the lessons we have learned from the tests at City College. There are those who contend that it is a waste of time and money to install ventilating systems at all, and that the best way to get fresh air is to throw open the window. One of the largest private schools in the city has been built on this principle, upon the advice of a prominent physician.

"Then there are those who believe in putting cloth frames in the windows and letting the air filter in that way. Others would have the air let in at the top of the room and taken out at the bottom, and still others argue that it should be just the other way around—let in at the bottom and drawn off at the top. There are so many theories that the only way to settle the question is to put them all to the test.

"That is just what we intend to do, and by observing closely how the children get along in their studies and in their health we hope to arrive at the best method of supplying fresh air in the public schools."

### Plans for International Engineering Congress Going Forward.

A report having been circulated to the effect that the International Engineering Congress was to be abandoned, the Committee of Management has issued a bulletin stating that this is not correct and that the congress will be held in San Francisco as scheduled, from September 20 to 25, 1915. Previous to the beginning of the European war, the total number of papers contemplated was about 290. While it is expected that a portion of these will not now be secured, especially those apportioned among the nations now at war, it is believed that by substituting other papers that have been offered, the general plans of the congress may be carried out with a minimum of change.

The present plan is to divide the congress into ten or more sections which will hold their meetings in the new Auditorium Building in the Civic Center of San Fran-

cisco. The transactions will be published in ten volumes, 6 x 9 in. in size, and of about 500 pages each, with one smaller or half volume which will contain the reports of the general or business meetings of the congress, together with a title and author index and a brief digest of each paper presented. In the schedule of volumes heating and ventilating engineering will be covered in Volume X, Miscellaneous.

The committee states that in the circumstances which have developed as a result of the European war, it is more than ever in need of strong and immediate support from American engineers. The general fee for membership is $5.00, which will entitle the member to receive the index volume and any single volume of the transactions he may select, together with the right of participation in all the general activities and privileges of the congress. A detailed circular of information regarding the publications of the congress has been prepared by the committee and will be sent upon application to the secretary, W. A. Cattell, Foxcroft Building, San Francisco, Cal.

**French Heating Engineer at the Front.**

A letter received from August Beaurrienne, the French heating engineer, who, it will be recalled, read a paper on "Heating Practice in France" before the American Society of Heating and Ventilating Engineers, two years ago and was also one of the speakers at the heating engineers' dinner that year, states that he has joined the colors and is stationed at Fort des Barres, Belfort, where he is a lieutenant in the Ninth Regiment of Artillery. In his letter, dated October 1, he says "I am waiting for the Germans." He concludes his letter with: "I wish you have a pleasant time for Christmas and with the hope to meet you after the war, I remain," etc.

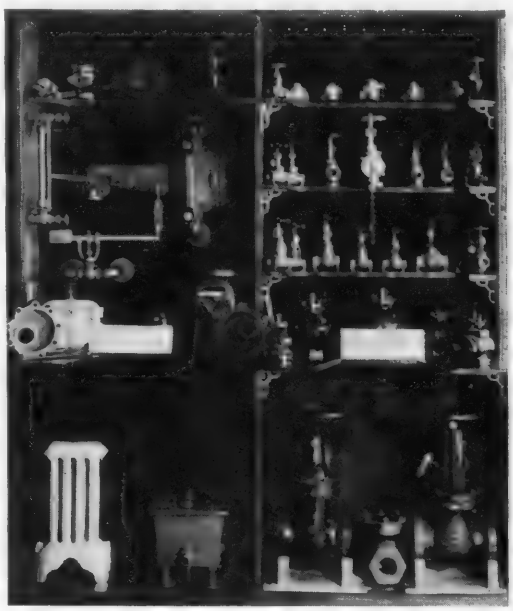
**Building Operations for October.**

Building operations for October, 1914, showed an improvement over those for September, 1914, but were not up to the corresponding month of 1913. While the September figures were $44,971,904, as compared with $65,844,495 for September, 1913, a decrease of 32%, the October decreases from October, 1913, was 20%. The recovery thus indicated is taken as showing the trend towards normal conditions.

The official reports of building permits issued in 74 cities during October, received by the American Contractor, Chicago, total $42,657,228 as compared with $52,988,653 for October, 1913. About one-fourth of the cities show gains and about three-fourths losses. The boroughs of Manhattan, Bronx and Brooklyn in New York City all showed gains, the net gain for the whole city being 16%, the figures being $9,242,638 as against $7,985,108 for October, 1913. Chicago showed a loss of 27% from $9,314,050 in 1913 to $6,774,200 this year. Other cities that gained were St. Louis, 36%; San Francisco, 32%; Cleveland, 14%; Columbus, 10%, and Seattle, 29%. Among the cities that showed considerable losses were Baltimore, 57%; Chicago 27%; Cincinnati, 32%; Detroit, 51%; Kansas City, 41%; 65%; Milwaukee, 50%; Minneapolis, 15%; Pittsburgh, 20%, and Toledo, 52%.

**Engineers' Permanent Exhibit.**

A permanent exhibit of goods used in the mechanical, electrical and heating and ventilating field has been established in New York at 40 West 39th Street, by H. P. Nicholson, formerly with Crane Company. The idea of the exhibit is to afford an opportunity to the designing engineer to inspect any particular product in which he is interested and have it demonstrated to him in an entirely disinterested manner. Mr. Nicholson states that engineers frequently hesitate to visit the showrooms of manufacturers on account of the follow-up methods that are the general rule. It has been found, therefore, that there is a strong demand for a place where the various products can be seen and studied without sub-



TYPICAL EXHIBITS AT THE ENGINEERS' PERMANENT EXHIBIT.

jecting the engineer to the slightest obligation.

The accompanying illustration shows how the exhibition booths are arranged, each booth being 3 ft. wide, 2 ft. deep and 7 ft. 6 in. high. Here the engineer may inspect the goods at leisure and, if desired, an assistant will make a demonstration of them. In addition, the exhibit offers to furnish the engineer with any information he may require regarding sizes, etc., of apparatus.

The location of the exhibit is almost directly opposite the Engineering Societies Building on West 39th Street, so that it is easily accessible to those who attend the meetings held there. It is estimated that no less than 100,000 engineers visit the Engineering Societies Building each year.

## New Rate Schedule for Hot Water Heating in Toledo, Ohio.

A new schedule of rates, rules and regulations for hot water heating in Toledo, Ohio, has been filed by the Toledo Railways and Light Company with the Ohio Utilities Commission and accepted by the commission.

The rates are based on the following rules for determining the square feet of radiation required to heat a given building:

Obtain area of exposed walls in building. From this subtract the area of window and door openings (frame measurement) in exposed walls. This remainder should be divided by wall constant (see table), and to the result should be added the area of window and door openings (frame measurement). This sum should be multiplied by 75, and to this result should be added the cubic contents of the room. This sum should be multiplied by temperature constant (see table). The result is the square feet of radiation (direct) required to heat building when building is of good construction.

TEMPERATURE CONSTANTS

0.005 —50 degrees
0.006 —55 degrees
0.007 —60 degrees
0.0075—65 degrees
0.0082—70 degrees
0.009 —75 degrees

WALL CONSTANTS

1 for ⅞-in. wall
2 for 2-in. wall
3 for 4-in. wall
5 for 6 to 9-in. wall
7 for 9 to 12-in. wall
8 for 13 to 27-in. wall

(NOTE.—The temperature to be figured at the degree guaranteed by the company in each individual contract.)

Any residence or inhabited room will have 65° F. as a minimum temperature. Any store room or garage may have a temperature with 50° F. as the minimum.

Any room or space having an opening which may communicate with the rooms or space to be heated, must be included in the measurement for space heated, whether radiation be installed or not in such room or space

The foregoing rule is for ideal conditions, requiring the minimum amount of heat for given cubic contents. To the radiation requirement thus calculated, there must be added a percentage to provide for exposed locations, bad construction, insufficient or improper repairs, and other conditions which would make the minimum radiation requirements inadequate to keep the building comfortably warmed. These conditions, which cannot be ascertained by general rule, add from five to twenty-five per cent. above the minimum or ideal requirements.

In all cases where the conditions are not ideal, as above defined, the company shall so notify the applicant, and shall specify the particulars in which the building is not in ideal condition, and shall indicate the percentage of radiation which must be added by reason of such condition of the building, whereupon the applicant shall have the option of making the repairs and changes so specified, or any part of them, and shall be entitled to a corresponding reduction in the per cent. of increased radiation required.

The hot water is to be furnished in sufficient quantity to heat said building to a temperature of.....degrees F. in coldest weather, provided that sufficient radiation be installed by the consumer to maintain the desired temperature. Evidence to the sufficiency of quantity of water shall be that the temperature of the hot water has not dropped more than 30° while passing through the consumer's heating system, as shown by not less than four tests taken fifteen minutes apart in succession, tests to be made at the point of entrance of service to the building. When the radiation connected to the system exceeds the amount of radiation as figured by the formula for the temperature contracted for, the drop in temperature shall exceed the 30° drop in the same percentage as the connected radiation exceeds the radiation demand as figured by the formula for the temperature contracted for.

(NOTE.—The guaranteed temperature to be left blank and inserted in each individual contract, as contracted for.)

The surface area of all hot water pipes installed in basement, or other space on the premises, not included in the measurement for radiation, will be charged for as radiation unless pipes be covered with an efficient pipe covering of not less than one inch thickness.

RATES—DIRECT RADIATION.

| | | |
|---|---|---|
| $0.20 per season | per sq. ft. of radiation | 0 to 500 sq. ft. |

0.1888 per sq. ft. of radiation per season 1501 to 2000 sq. ft.
0.1777 per sq. ft. of radiation per season 2001 to 5000 sq. ft.
0.1666 per sq. ft. of radiation per season 5001 or over sq. ft.

40% of above rates added for indirect radiation.

Consumers connected to the hot water service September 30 or later will be charged 50% of the expired portion of the heating season, and at the full rate for the balance of the season.

Where for any reason this clause becomes inoperative, the following basis will be used. Figures represent per cent. of season's heating.

| | | | | | |
|---|---|---|---|---|---|
| September | 2% | Decemeber | 17% | March | 15% |
| October | 5% | January | 20% | April | 9% |
| November | 12% | February | 16% | May | 4% |

A discount of 10% allowed if paid at the office of the company within ten days from date of bill.

### New York Steam Company Directed to Relay Its Pipe Trenches.

Following a number of hearings on the subject the New York Steam Company, which operates two central heating systems in New York, one in the downtown district and the other uptown, has been directed by the New York Public Service Commission of the First District to replace its present steam pipe trenches with mains of more modern design. The company at present has in operation some 60,000 ft. of steam mains, most of which are carried in trenches of the construction shown in Fig. 1. This is known as the brick trench type. This method of insulation has long been recognized as being unsatisfactory but the situation was brought to a head by the excavating for the new extensions of the New York subway. Among other things, it was feared that the leakage of heat from the pipe trenches would destroy the waterproofing of the subway.

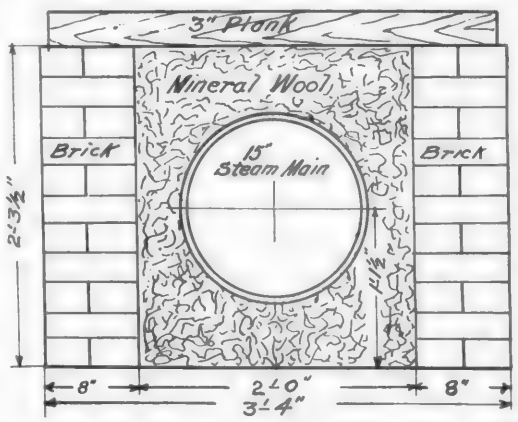



FIG. 1—OLD CONSTRUCTION OF NEW YORK STEAM COMPANY'S MAINS.

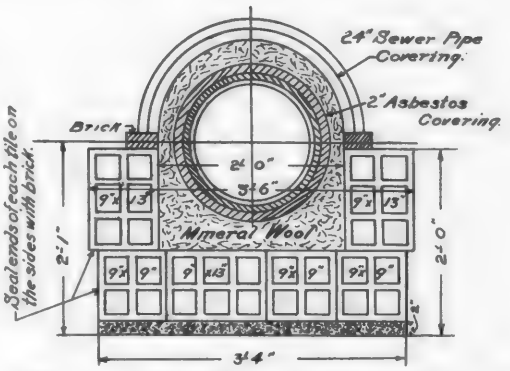



FIG. 2—MODERN CONSTRUCTION OF STEAM MAINS AS SPECIFIED BY THE NEW YORK PUBLIC SERVICE COMMISSION.

As a result of the order the company is required to replace its present mains with those of the modern tile construction, as shown in Fig. 2 "or by some other type of construction equally good, to be approved by the commission." This work is to be done within five years at the rate of not less than 12,000 ft. in each year, beginning September 1, 1914. The New York Steam Company has signified its intention to comply with the order but is at present negotiating with the commission with a view of adopting a form of construction that will permit it to make use of its present brick trenches in certain sections.

The investigation resulting in the commission's order was made by the Division of Subsurface Structures of which C. M. Green is the directing engineer.

# CORRESPONDENCE

### The Elizabeth Hospital Hot Water Heating Plant.

EDITOR HEATING AND VENTILATING MAGAZINE: Referring to your October issue, which contains an article on "An Extensive Open Tank Gravity Hot Water Heating System," by George Stumpf, Jr., the title states and it is repeated further on in the article that this system is of the open tank type, whereas in the advertising section of the same issue, the National Steam Specialty Company advertises that its heat intensifiers were used and that the system is operated under pressure. The latter statement does not seem to agree with the article as written by Mr. Stumpf.

In Item 3, Page 17, in Mr. Stumpf's article, he states that the cost of the piping system, including fittings, hangers, valves and labor complete, for the gravity job, was about 220% of the cost of an equipment for a hot water heating system under forced circulation. According to Mr. Stumpf's reasonings and the figures given in connection with Item 3, it would seem that the above items will amount to approximately $14,000 for the gravity system.

In general, it could be stated that a hot water heating system for this type of building can be installed complete with the exception of boilers, for approximately $1 per square foot. This would tend to show that the heating system, comprising the mains, risers, radiators and accessories, would amount to about $36,000. These figures show that there was $22,000 allowed for the radiators or about 60 cents per square foot. It is generally possible to have radiators alone installed and set up complete for not over 40 cents per square foot. It would seem from the above that a greater amount than $6,800 should be allowed for the difference between the cost of the gravity system and the cost of a forced circulation system. Of course, the greater this difference, the more it would tend to show economy with the forced system.

I might also remark that the efficiency of the radiators under forced circulation would probably be higher than those under gravity circulation, in which event the total amount of radiation in the building could be reduced. It also seems that for a group of buildings of the size of the St. Elizabeth Hospital, electric current could be obtained for less than 6 cents per K. W.

I do not doubt that Mr. Stumpf has gone into this problem very thoroughly, but it does not seem that there should be the economy claimed in the gravity system over that of the forced circulation system for a group of buildings of this size. Permit me to inquire as to whether Mr. Stumpf looked into the question of centrifugal pumps operated with low-pressure steam turbines.

It would hardly strike one as reasonable that in an installation of this size, where there is a possibility of the future extension of the buildings, quite common to hospital groups, a gravity system should be installed. With the present system as laid out and the careful balancing that has been done, the system at present is absolutely inflexible and unable to care for any additional buildings which may be added to the group.

I believe it would be quite interesting to the readers of THE HEATING AND VENTILATING MAGAZINE if the author would publish some of the sizes of mains, risers and radiator connections in which he has balanced the friction to within 1½%. The above-mentioned article has been read with considerable interest and should be quite instructive to the heating and ventilating profession.

The above remarks should not be taken as a criticism of Mr. Stumpf's article, but should be looked upon in the light of one seeking information. ERNEST WILLIAMS.

New York, November, 1914.

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REPLY BY GEORGE STUMPF, JR.

The hot water heating system for the St. Elizabeth Hospital was designed on the open-tank principle and has been in operation as such for two months under the direction of the writer. However, due to an oversight, the writer failed to mention that certain pressure valves or heat intensifiers were connected by means of a by-pass line to the expansion tank pipe. This arrangement makes it possible to operate the system under pressure by merely manipulating a few shut-off valves.

The contract stipulated that the building was to be heated to 70° F. in zero weather with a total of 36,000 sq. ft. or more of heating surface. It was found that this minimum amount of radiation (36,000 sq. ft.) would supply the heat losses through the exposed building surfaces if the water circulated at a maximum supply water temperature of 210° F. at the boilers. Therefore, the system would be capable of meeting the contract requirements when operating with an open tank. However, if the outside temperature at any time should be below zero, the system may quickly be put under pressure and the supply water temperature raised above the boiling point.

The fact that the system may operate either at atmosphere or above atmospheric pressure does not in any way alter the writer's previous statements, but one might be led to believe, from the first paragraph of Mr. Williams' letter, that the design and operating results would be essentially changed. It should be understood that the use of intensifiers on a gravity heating system has no relation whatever to success in obtaining uniform circulation and satisfactory heating results. The installation of automatic pressure valves or intensifiers will permit the supply water temperatures to run as high as 240° F. and will reduce the cost of radiation and piping as compared with that of a system operating open tank, with 210° F. maximum supply temperature.

Regarding the relative cost of piping, etc., of the forced circulation and gravity hot water systems, the writer wishes to emphasize the fact that his proportions are correct, as they are based on original estimates. Mr. Williams' assumption of $1 per square foot for

piping and radiators installed is wrong for an installation designed similar to the one under discussion, as shown by the following data:

| | Forced circulation — maximum temperature of supply water 210° F. | Gravity circulation — maximum temperature of supply water 210° F. |
|---|---|---|
| Pipe, fittings, hangers valves and erection | $8,000 | $17,200 |
| Radiators installed | 9,600 | 9,900 |
| Cost per square foot | $0.49 | $0.75 |
| Boilers tanks, etc., expense and miscellaneous | $7,500 | $7,500 |
| Pump and electric motor, pump and steam turbine, governors and rheostats, steam and electric connections complete | $2,600 | ..... |
| Total cost | $27,700 | $34,600 |

By these figures it will be seen that the difference in cost of the two systems is $6,900, showing that the cost of a piping system for gravity circulation is about 220% of the cost of an equipment for forced circulation. The radiator cost for the gravity system is approximately 4% more than for the forced system.

It is also interesting to note that the cost of a complete system, including boiler plant, etc., is about $1 per square foot of direct radiation installed.

The electric current used throughout the buildings will hardly be of sufficient amount to obtain a lower rate than 6 cents per K. W. This hospital is owned by a charitable organization which is compelled to keep operating and other expenses at a minimum, therefore no correct comparison can be made with the electric power used in other institutions of like size.

Steam turbines did receive consideration, but it was found that the house service hot water supply and the sterilizing fixtures, etc., would not consume enough of the exhaust steam to bring about any startling economy in operating expenses.

In this group it is impossible to build additional buildings at the convent end, which is the only direction in which the gravity system is inflexible. Although there is not even a remote possibility of extending the buildings in any other direction, there is no reason to claim that a gravity hot water heating system is any more inflexible than a forced circulation system in this particular instance. Elevations of boiler and radiators are ideal for extensions similar to the present buildings. It would be necessary, however, to pipe back all such additional heating surface direct to the boilers unless proper provision had been made by increasing the present mains.

Even a gravity steam, vacuum steam or a forced hot water piping system working on a limited loss of pressure is inflexible and unable to care for future buildings and it would be necessary to connect back to the boiler or other source of supply unless provision had been made in the mains.

Present day competition compels one to take full advantage of available forces in proportioning the piping in circulation systems of any heating medium in order to minimize the cost of installation and operation. Why should it be necessary to install piping systems to supply possible future extensions, if such additions are not even contemplated?

Therefore, the writer feels justified in claiming "that a gravity hot water heating system is an economical proposition under certain favorable and necessary conditions and levels of boilers and radiators."

**Heat Transmitted Through Windows.**

A recent article in Concrete-Cement Age, in referring to metal window sash says:

"Metal sash, when properly fitted into the concrete, are practically dust and air-tight and in this respect possess an important advantage over the old style wooden windows. One manager found that by using these he saved enough on his fuel bill the first winter to warrant the additional investment involved.

"Large window area was formerly held objectionable on account of the supposedly greater difficulty of heating. With wood frames this objection is doubtless potent. This is because wood cannot be made air-tight. It is the heat loss around the frame rather than through the pane that is serious. Metal windows, if properly fitted, are practically leak-proof. Tests have shown that no more heat is transmitted through this type of window than through a 12-in. brick wall. Double-glazing of the sashes decreases this loss still further, and the maximum result is obtained by duplicating the sashes as well. This is expensive, yet probably preferable to sacrificing any appreciable portion of the wall space available for windows in order to effect a slight saving in heating cost."

Commenting on the foregoing, Prof. William Kent has the following to say, in Industrial Engineering for September:

"All of which is important, if true, but we doubt the reliability of the tests that are said to have shown that no more heat is transmitted through a single-glazed metal window than through a 12-in. brick wall. The figures commonly used by heating en-

gineers and architects, based on Péclet's experiments, are, when reduced to B.T.U. per square foot per hour per degree difference of temperature, 12-in. brick wall, 0.33; single window, 1.20; indicating that the window transmits between three and four times as much heat as a brick wall 12 in. thick and of the same area as the window, and it is inconceivable that so careful an experimenter as Péclet would not take pains to prevent leakage of window frames when making experiments on glass surfaces."

**American Society of Mechanical Engineers.**

During October the membership of the American Society of Mechanical Engineers passed the 6,000 mark, showing a gain of over 12% for the past ten months.

At a meeting of the council, October 9, the general subject of the boiler code was discussed and Alex. C. Humphreys, E. B. Katte and I. E. Moultrop were appointed a special committee to draft a resolution for consideration by the council, covering action to be taken on this report. The resolution which was adopted requested the boiler code committee to prepare a reprint of its preliminary report and give all other committees from the mechanical engineers' and other societies with whom it has conferred full opportunity to concur therewith or submit objections thereto. After this procedure, the committee is requested to report to the council for its further action.

The report of the committee on the standardization of flanges was ordered published in the society's Transactions.

**War Map of American Trade Opportunities.**

A world map, upon which are indicated the trade opportunities opened to Americans because of the partial suspension of the commerce of the warring countries has recently been published by the research department of the Alexander Hamilton Institute, Astor Place, New York. The map was passed around among the members attending the meeting of the American Manufacturers' Export Association at its meeting in October, where it attracted much attention. On the back of the map is printed a tabular statement of American industries, showing the people engaged in each industry, the capital employed, the annual production, exports, imports, the effects of the war on the foreign trade of each industry, the effects on prices and other effects.

The classified data contained in the tabular statement cover 177 of the leading industries of the United States.

**Transmission of Heat from Warm to Cold Room.**

A room heated to 70° F. is adjacent to an unheated room having a total loss in heat units to the outside air of 200 B. T. U. per degree of temperature difference. When the temperature of the outside air is at zero, what will be the resulting temperature of the unheated room caused by the heat entering from the heated room which amounts to a total of 400 B. T. U. per degree of temperature difference between the two rooms?

$x - 0°$ = temperature difference between the unheated room and the air outside.

$70 - x$ = temperature difference between the two rooms.

Equating the two $200\ x = 400\ (70 - x)$.

$200\ x = 28{,}000 - 400\ x.$

$x = 140 - 2\ x.$

$3\ x = 140.$

$x = 46\ 2\text{-}3°$ F. temperature of the unheated room.

# NEW DEVICES

**New Principle for Rotary Air Compressor.**

A rotary air compressor in which both the rotor and rotor case revolve, one within the other, in the same direction and at the same velocity (R.P.M.) has been brought out by the Wernicke-Hatcher Pump Co., Grand

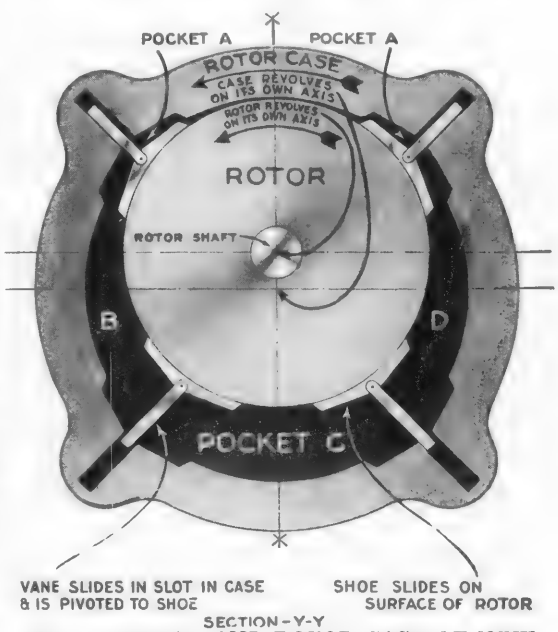



FIG. 1—ROTOR AND ROTOR CASE OF NEW AIR COMPRESSOR.

Rapids, Mich. The rotor and rotor case each revolves on its own axis in balance. The accompanying illustrations show the principle involved, details being omitted and proportions exaggerated. It will be noted that each pocket is provided with an intake valve and discharge valve, connecting through suitable passages with the intake and discharge passages in the hollow rotor shaft. Figs. 1-2 show successive positions taken by the compressing elements while the compressor revolves through one-fourth of a revolution. It will also be seen that as each pocket passes from the position of A to that of C (Fig. 1), or through one-half revolution, it expands and sucks in air, and through the other half of the revolution compresses this air and discharges it.

Among the advantages mentioned for this new principle is that it makes possible an effective and reliable cooling system, because the heat of compression is practically eliminated at its source by radiation. This feature enables the compressor to operate at high pressures with a low temperature rise. It also permits the advantages obtained by rotary motion, as all heavy moving parts are balanced and rotate at uniform speed. Constant and continuous compression equalizes all strains and bearing pressures. Also all sliding parts have relatively small and slow motion, reducing friction.

In addition, this type of compressor permits effective sealing of air at high pressure. During compression the pressure in the leading pocket is always greater than the following pocket, which presses the vane against the walls of the slot, preventing back leakage (see positions of vanes in Figs. 1-2).

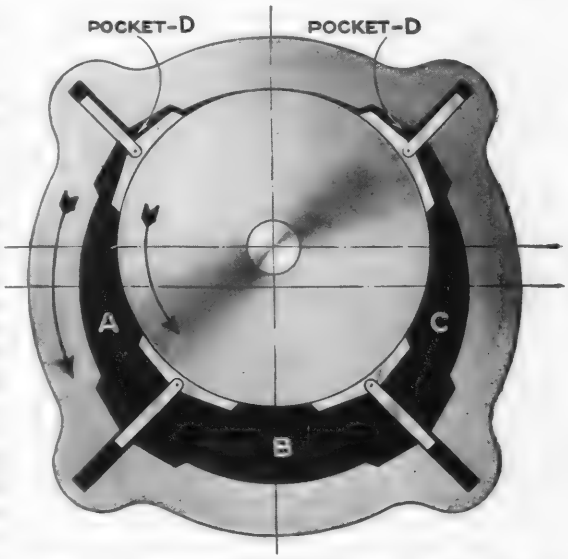



FIG. 2—SUCCESSIVE POSITION TAKEN BY COMPRESSING ELEMENTS THROUGH ONE-FOURTH OF A REVOLUTION.

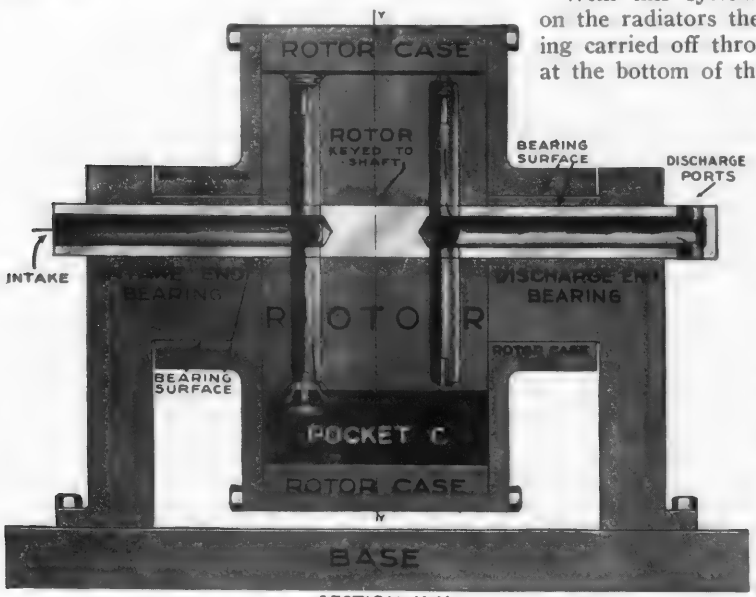
The manufacturers state that this machine is made for pressures up to 100 lbs. A compressor having eight compressing pockets, and making 3,200 compressions per minute at 400 R.P.M. will deliver 75 cu. ft. of air at 100 lbs. pressure.

### Richardson Vapor Vacuum Pressure System.

A new vapor heating system, known as the Richardson V. V. P. System has recently been placed on the market by the Richardson & Boynton Co., New York, the principal appliances of which are shown herewith.

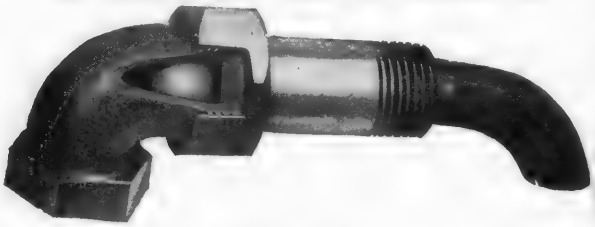
With this system, no air valves are used on the radiators the air and condensation being carried off through the return connection at the bottom of the radiator, which, in turn, is connected to the main air line in the cellar. At the end of this line is placed the Richardson air expeller and vacuum trap, with connection to chimney flue. The air expeller allows the air to pass off to the flue, but is designed to close when steam or vapor reaches it.

Each radiator is supplied with a Richardson packless graduated valve with hard rubber handle. The valve is connected into the top of the radiator at one end and the graduations

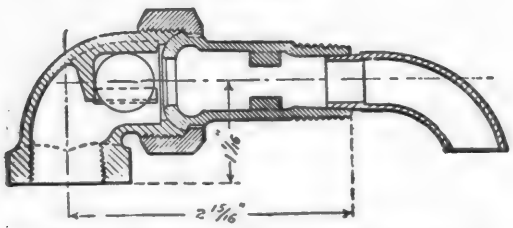



CROSS SECTIONAL VIEW OF NEW ROTARY AIR COMPRESSOR.

as is usual with this type of valve, allow all or any part of the radiation to be heated as desired. On the return is placed the Richardson water seal ball check union elbow. As the vapor in the radiator condenses, water collects in the bottom of the radiator until it rises to the water line of the water seal, when it passes off through the return connection. Above the water seal is an air vent opening to allow the air to pass from the radiators, the air and water being carried back from all the radiators by the return line to a point near



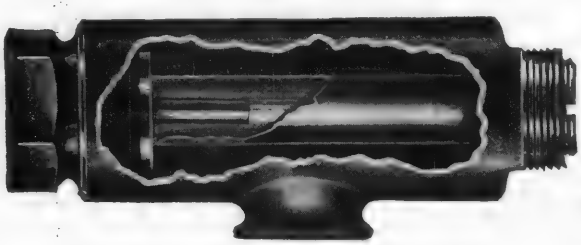
Patented.



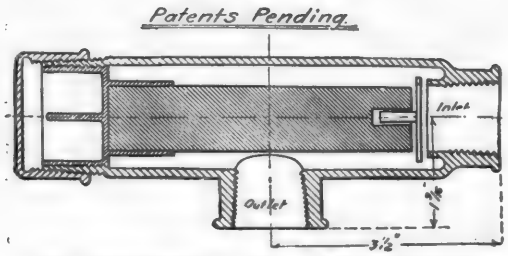

RETURN ELBOW, VENT AND SEAL OF RICHARDSON VAPOR-VACUUM-PRESSURE SYSTEM.

the boiler. The condensed water is then returned to the boiler and the air passes off to the chimney flue through the air expeller, as stated.

The Richardson packless graduated supply valve used with this system is made so that a three-quarter turn opens or closes the valve.

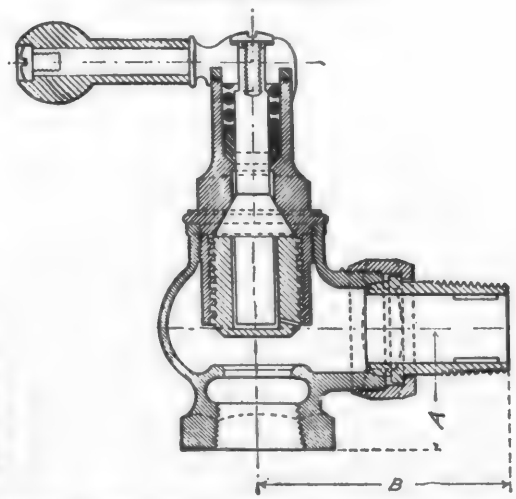


Patents Pending.




AIR EXPELLER AND VACUUM TRAP.

Patents Pending.




PACKLESS GRADUATED SUPPLY VALVE FOR CONNECTION TO TOP OF RADIATOR.

It is also graduated for partial opening. The valves are made in ¾-in. and 1-in. sizes, the ¾-in. size being ample for radiators up to 100 sq. ft.

The Richardson water seal ball check union elbow is made in only one size, ½-in., which has been found to be ample for all radiators. It is placed at the bottom of the radiator and, except on very long radiators, at the same end as the supply valve. As soon as the fire

is started the ball check opens and allows the condensation to pass freely into the return. If the supply valve is closed, the ball check closes and prevents water or vapor from backing into the radiator. This return valve is made entirely automatic so as to require no attention. The air vent opening in the tail piece of the elbow serves to equalize the pressure on both sides of the water seal preventing syphoning, and also allows the air in the radiator to escape into the return as soon as the supply valve is opened.

The Richardson air expeller and vacuum trap, placed at the end of the air line return in the cellar near the boiler, takes the place of the air valves on the radiators. It is arranged, as stated, to automatically release all of the air from the system, but to close by expansion as soon as steam or vapor reaches it. A connection is taken from the bottom tapping to the chimney flue, which creates a partial vacuum on the system.

### Sterling Air Humidifier.

An interesting apparatus intended for use in offices, residences, club rooms and similar quarters is the Sterling air humidifier, by which, it is stated, the air may be kept fresh, clean and properly tempered as well as properly moistened. It is especially useful in supplying the

STERLING AIR HUMIDIFIER.

essential moisture to air that is over-dry in steam-heated rooms. It is also designed to extract the dirt and dust from the circulating air. The apparatus is described as a complete ventilating system, supplying fresh air that has been forced into spray water. It can be operated from a plugged connection to the lighting circuit at an electric current consumption of 1/10 K. W. per hour. The Sterling air humidifier is built in two sizes, the manufacturers being the Blomfeldt & Rapp Co., 108 No. Jefferson St., Chicago, Ill.

### A New Electrical Long Distance Transmitting, Indicating and Recording System.

A new electrical long distance transmitting indicating and recording system is being placed on the market by the Bristol Company, Waterbury, Conn. In these instruments Bards patent long distance induction balance movements are employed as especially developed for this purpose by the Sangamo Electric Company. Bristol recording instruments,

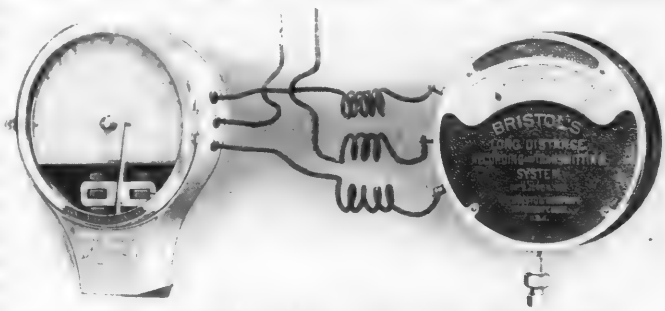


FIG. 1—STANDARD UNIT OF LONG DISTANCE TRANSMITTING AND RECORDING INSTRUMENTS.

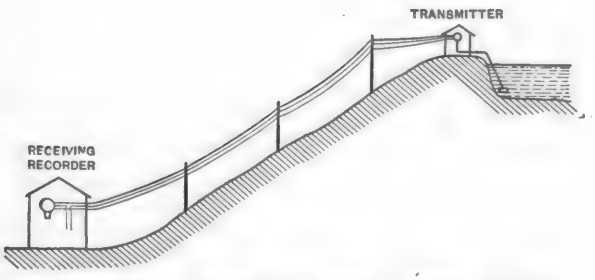
when equipped with these electrical transmitting systems, are capable of producing automatic and continuous records of pressure, liquid levels, temperatures, mechanical motions, etc., at long distances, even many miles from points at which the transmitters are located.

Fig. 1 shows a standard unit of these transmitting and recording instruments, including the transmitting indicator for installation at the point where the pressure or temperature, etc., is measured, and the receiving recorder which is installed at the remote point where it is desired to have the record produced.

The two instruments are shown connected by three wires, one of which is connected to a source of alternating current, as for instance, a lighting circuit.

This long distance system is particularly well adapted for use under ordinary operating conditions as there are no sliding or make and break contacts employed, and the effects of variation of temperature or resistance along the circuit are negligible.

The needs for such equipment are numerous in connection with water works, central heating stations, hydro-electric plants, gas distribution systems and irrigation projects.




TYPICAL INSTALLATION, WITH TRANSMITTING INDICATOR ON BANK OF RESERVOIR AND RECORDING INSTRUMENT IN PUMPING STATION.

Although this equipment is only now being put on the market in commercial form it is not untried as preliminary models have been in actual service giving satisfactory results for more than four years.

One of the first outfits of these patented instruments was installed at Peoria, Ill., to indicate at the central station the steam pressure at the end of the steam heating main, and the superintendent of the electrical department of the Central Illinois Lighting Company by whom this was used has made the following statement: "In regard to this particular outfit which has been in service more than four years, two other systems were installed by us on the strength of the success by the first system, and all have given very good service." Over a dozen other sets of this equipment have also been in successful service for more than two years.

The fundamental principle of the Bristol long distance transmitting and recording system is that of the induction balance. The transmitting instrument and the receiving instrument are each equipped with two pairs

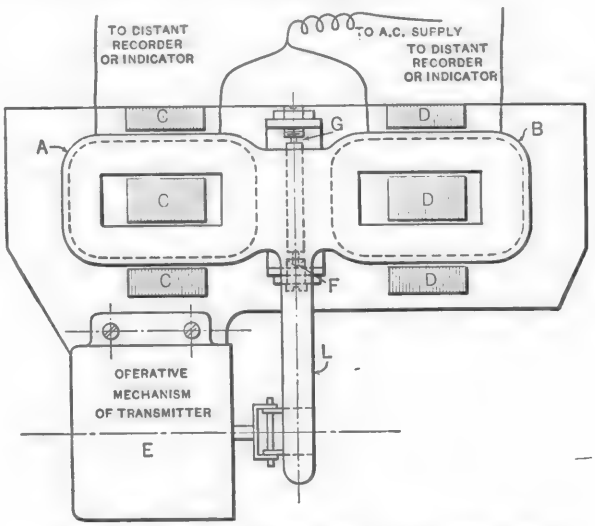



FIG. 4—FRONT OUTLINE DIAGRAM OF TRANSMITTING DEVICE.

of coils arranged to swing in a horizontal plane over iron cores. Fig. 3 shows the interior of one of the transmitting instruments. In this instrument the helical form pressure tube and the electrical transmitting device are shown in the operating position.

The complete outfit consists of two pair of mechanically balanced solenoids arranged to swing horizontally back and forth over the ends of soft iron cores and connected in parallel to an A. C. circuit. One pair of the solenoids is used for the transmitting instrument, the other pair for the receiving instrument. Front view Fig. 4 of the transmitter shows one pair of the solenoids A and B on spools connected together and supported on a shaft, the ends of which rest in jewel bearings at G and F and free to swing back and forth over laminated soft iron cores C and D. The top view Fig. 5 shows the solenoids A and B of the transmitter in section and by the dotted outline the position to which the solenoids may swing is also indicated.

A similar pair of balanced solenoids is placed in the receiving recorder or indicator at the distant point. When the solenoids A and B of the transmitter and receiver are connected in parallel to an A. C. circuit and the transmitter coils A and B are held in some certain position by the operating mechanism located at E (water level gauge, press-

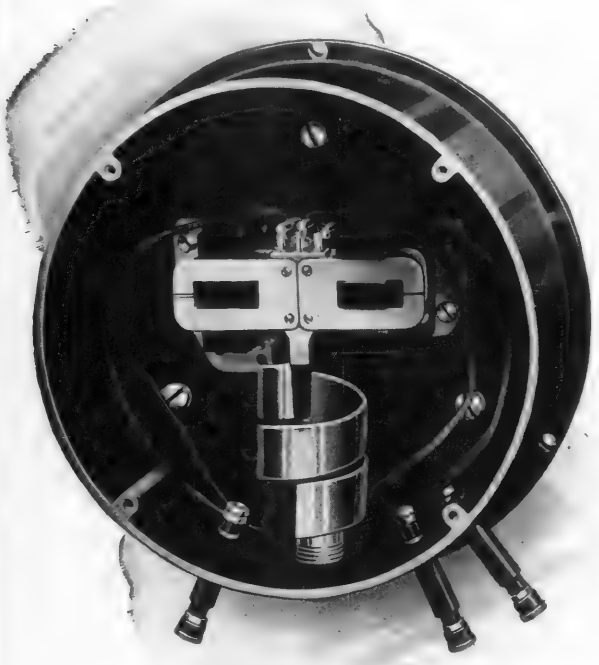


FIG. 3—INTERIOR OF ONE OF THE TRANSMITTING INSTRUMENTS.

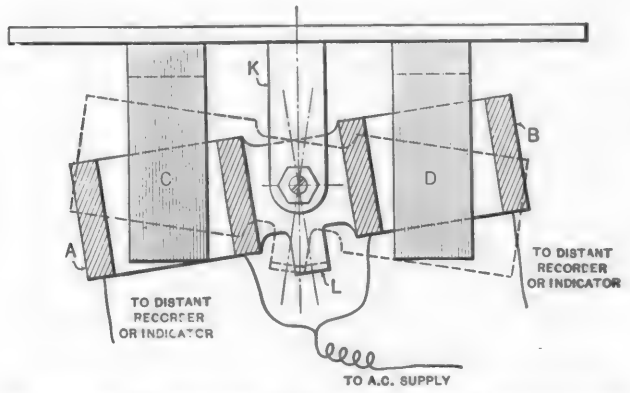



FIG. 5—TOP OUTLINE DIAGRAM OF TRANSMITTING DEVICE.

ure gauge, thermometer, etc.) the relative amounts of current flowing in solenoids A and B will depend on their positions on the iron cores C and D due to the inductive effect of same.

At the receiving instrument the other pair of solenoids are mechanically balanced and free to take an angular position which will be the same as that of the transmitter since the flow of current will be the same in the corresponding solenoids of the receiver as in the transmitter. If the angular position of the pair of solenoids at the transmitter is changed by the operating mechanism thus moving one of the solenoids off and the other on to the iron cores, increasing the inductance in one solenoid and diminishing it in the other, the flow of current will be proportionately increased in one coil and diminished in the other. The variations of current at the distant receiver will correspond with the variations at the transmitter, and cause the pair of solenoids of the receiver to seek a position of balance which will be the same as that of the solenoids of the transmitter.

In the transmitter the operating mechanism is linked dircetly to the balanced solenoids by means of an arm L. In the receiver the recording pen or the indicating pointer is connected to a similar arm through a simple, and practically frictionless multilpying mechanism.

Various combinations of transmitting and receiving instruments of either indicating or continuous recording type may be furnished. Fig. 1 illustrates the standard equipment including a transmitting indicator and a receiving recorder, but it is possible to furnish the transmitter and receiver in either the indicating or recording type. Fig. 6 shows a combination outfit including two transmitters and one receiving indicator connected with a two point rotary switch so that readings may be obtained with the indicator of the pressures, temperatures, etc., from either of the transmitters.

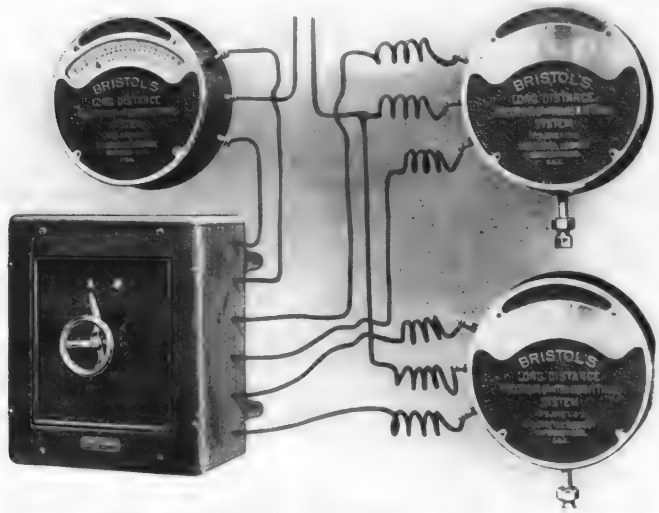



FIG 6—COMBINATION OUTFIT OF TWO TRANSMITTERS AND ONE RECEIVING INDICATOR.

## Trade Literature.

WROT IRON HERALD, Vol. 1, No. 1, is a unique circular in the shape of a blotter, the reverse side being devoted to the Wrot Iron furnaces, the product of the Wrot Iron Heater Co., Des Moines, Ia.

VALVE WORLD for November, 1914, published by the Crane Company, Chicago, announces the election of Charles H. Penny as a member of the board of directors of the Crane Co. It is also announced that the 1914 edition of Crane Co.'s No. 40 pocket catalogue is off the press and ready for distribution. The adoption of the American standard for flanges affected the greater number of pages, this standard covering low pressure, standard medium and extra heavy flanges on valves and fittings.

SIROCCO AT THE FORD PLANT is the title of a special bulletin published by the American Blower Co., Detroit, Mich., describing the notable installation at the main American and branch Canadian plants of the Ford Motor Company of Sirocco heating, ventilating and cooling systems (illustrated and described in THE HEATING AND VENTILATING MAGAZINE for April, 1914, and Sep-

tember, 1914). This Sirocco installation is the largest of its kind ever made and it is unique in that the only other places where air distribution is handled in a similar manner (with air flues and ducts through the concrete building columns) are at the large machine shop building in Baltimore for which the American Blower Company is building the heating and air conditioning equipment. Size 8½ x 11 in. (standard). Pp. 16.

GOLDEN-ANDERSON DOUBLE-CUSHIONED TRIPLE-ACTING NON-RETURN VALVES, designed to automatically protect the boilers and steam lines, are featured in a blanket circular issued by the manufacturers, the Golden-Anderson Valve Specialty Co., Pittsburgh, Pa. The company states that the United States Steel Corporation has ordered 1,200 of these valves "for the protection of their power stations." They are described as the heaviest valves made and owing to their inside mechanical construction are guaranteed not to chatter, hammer or stick. The bulletin also shows the company's line of cushioned automatic quick-closing stop valves, reducing valves, controlling altitude valves, water-pressure regulating valves, float valves and water-relief valves. Size 9 x 12 in. Pp. 8.

DE LAVAL CENTRIFUGAL PUMPS, made by the De Laval Steam Turbine Company, Trenton, N. J., are called to the attention of the trade through a unique form of circular letter in which the statement is made that "for circulating hot water in heating systems, the centrifugal pump is the only one that should be used, since it does not give rise to disturbing noises in the piping system and radiators. It is ideal for motor or turbine drive, but turbine drive is nearly always preferable, since the exhaust steam from the turbine can be utilized in the water heater; thus the power for circulating the water costs practically nothing. The constant pressure maintained by the centrifugal pump is an advantage in that the pressure does not rise excessively when branches are shut off and an increased amount of water is not forced through the other branches as with the reciprocating pumps not provided with a pressure governor." The company states that it will send on request its 300-page book completely describing its centrifugal pumps.

SPENCER TUBULAR STEAM BOILER, described as a new type, is illustrated in a 4-page circular, sent out by the Spencer Heater Co., Scranton, Pa.

CONNERSVILLE CYCLOIDAL PUMPS are the subject of an impressive catalogue published by the manufacturers, the Connersville Blower Co., Connersville, Ind. Large and carefully executed views are included of the company's line of cycloidal rotary pumps for a variety of purposes and the entire catalogue is in keeping with the company's record of "more than twenty years of successful manufacturing." The special object of the catalogue is to call attention to the Connersville line of two-impeller cycloidal rotary pumps which are shown to be suitable for pumping water for various purposes, and for creating vacuum, high or low, for jet and surface condensers, for vacuum cleaning outfits, vacuum heating systems. One particular advantage of this type is stated to be its ability to handle air or gases and water simultaneously. The catalogue gives in detail the method of construction of these pumps and also takes up the principle and operation of the two-lobe and three-lobe cycloidal impellers. Size 9¼ x 12¼ in. Pp. 48.

INTRODUCING D. B. G. TO ——— is a clever form of mailing card sent out by the Joseph Dixon Crucible Co., Jersey City, N. J., introducing Dixon's boiler graphite to engineers and others interested in boiler cleaners. The

reverse fold forms a return card bearing an invitation to write for the Dixon booklet, "Graphite for the Boiler." The product is stated to prevent the hardening of scale and to give to the surface of the boilers a smooth polish, at the same time preventing pitting.

DOLE PACKLESS RADIATOR VALVES, showing the various types and styles of this well-known line, are the subject of a new catalogue published by the Dole Valve Co., Chicago, Ill. The company states that it has succeeded in its ambition, formed ten years ago, to be the builder of the best radiator valve on the market. The catalogue opens with a sectional view of the Dole angle valve illustrating the quick-opening feature, the double spiral thread, the one-piece rotating stem and the manner in which the stuffing box of the ordinary valve has been eliminated. Other types shown are the globe valve, right and left hand corner valves with union, lock shield valve, wood wheel straight-way gate valve, wood wheel angle gate valve, graduated valve, graduated lock shield valve, packless hot water valve, with both lever and wood lever handle and wood wheel. Size 3¾ in. x 8 in. Pp. 16.

### Notable Relief Valve Installation.

The accompanying illustration shows two 36-in. exhaust relief valves of special design, made by the G. M. Davis Regulator Co., Chicago, for the Edison Illuminating Co., Detroit. The valves will be installed at the Connors Creek Power House No. 1 in connection with the condensing apparatus of 20,000 Kw. turbines.

These valves have horizontal inlets and vertical upward discharge. They are 7½ ft. high and weigh 9,000 lbs. each. Provision is made to operate the valves hydraulically. There is a dash pot with metal packed plunger in the lower cover. A stem connects the plunger and disc.

When in operation, the hydraulic pressure under the plunger will be slightly less than the vacuum holding the disc to its seat. When the vacuum is lost, the valve will open and relieve to the atmosphere without any accumulation of pressure in the condenser. The discs are water sealed to prevent air leakages. All the internal parts may be removed through the opening in the body above the disc, without interfering with the pipe lines.

Ira N. Evans, of New York, heating and ventilating engineer, has been appointed mechanical engineer to the New York Department of Street Cleaning, under Commissioner of Street Cleaning J. F. Featherston. Mr. Evans will have charge of the organization of the new model district of the street cleaning department.

### New Buildings for the Ilg Electric Ventilating Company.

The Ilg Electric Ventilating Company, Chicago, manufacturers of ventilating machinery, etc., is building a seven-story and basement addition adjoining its present factory. The walls of the present building will be cut through, making the area of each floor 100 x 100 ft. The entire factory will be devoted to the manufacture of Ilg motor-driven fans and blowers, belted centrifugal blowers and special electric motors for driving fans and blowers.

The plant will be completely equipped with the latest automatic machinery and the company plans to keep on hand a large stock of apparatus of all kinds ready for shipment.

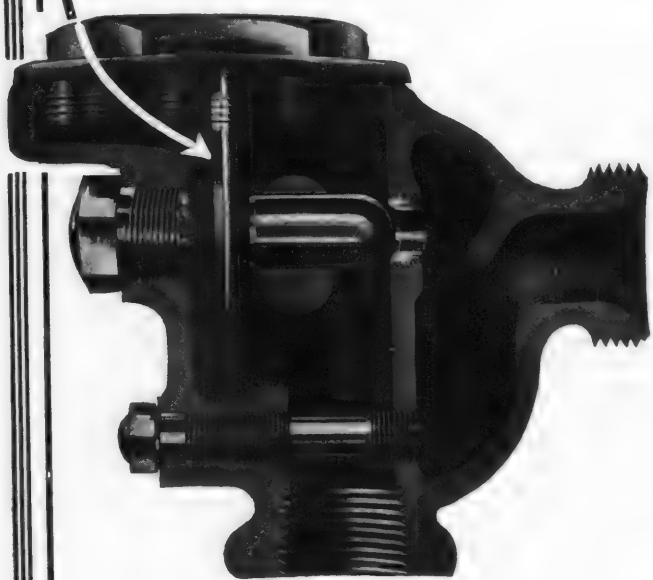
The seventh floor of the new addition will be devoted to the company's offices, which will look out over the roof of the present building to Lake Michigan. The present roof will be converted into a roof garden for recreation purposes for the use of the office employes.

In the basement of the new building will be placed locker rooms for the factory employes throughout the building. There will also be installed a complete system of modern shower baths and a swimming pool, 14 x 28 ft. The company believes that in this way it will be able to give the factory employes pleasant recreation in warm weather and that this swimming pool will pay on account of increased output and better work.

36-IN. EXHAUST RELIEF VALVES FOR THE CONNORS CREEK POWER HOUSE, NO. 1, OF THE EDISON ILLUMINATING COMPANY, DETROIT, MICH.

# 100% Efficient

This Thermostatic diaphragm dropped into the Monash Thermostatic Valve does the work



U. S. Patent, April 28, 1914

This valve has a loose thermostat which is not attached to the cover or body of the valve and **requires no adjustment.**

It has a spring bumper to take care of the over-expansion of the thermostat and prevent its collapse or rupture.

**MONASH THERMOSTATIC RETURN LINE VALVE**

*for*

Vacuum Heating Systems

For further information address

**MONASH ENGINEERING COMPANY**

1420 W. Jackson Blvd. **Chicago**

121 W. 42nd St. **New York**

# TRADE AND MISCELLANEOUS NOTES

### Coming Events.

**January 20-22, 1915.**—Annual meeting of The American Society of Heating and Ventilating Engineers, at the Engineering Societies Building, 29 West 39th Street, New York.

**Third Monday in Each Month.**—Meeting of the New York Chapter, American Society of Heating and Ventilating Engineers, Engineering Societies Building, New York (evening). Subject for December meeting: "Heating the Skyscraper and Its Problems," introduced by William H. Driscoll.

**Second Monday in Each Month.**—Meeting of the Illinois Chapter, American Society of Heating and Ventilating Engineers, in Chicago (evening).

**Second Tuesday in Each Month.**—Meeting of the Massachusetts Chapter, American Society of Heating and Ventilating Engineers, in Boston (evening).

### Deaths.

**Edward J. Sweeney,** treasurer of the Fischer-Sweeney Bronze Co., Hoboken, N. J., manufacturers of vacuum steam heating apparatus, died November 7, at St. Mary's Hospital, where he was awaiting an operation for gall-stones. He was 47 years old. Mr. Sweeney was considered an expert foundryman and had been engaged in that line throughout his business career. He held the position of foundry foreman for the A. P. Smith Mfg. Co., of East Orange, N. J., for 25 years, leaving that company in 1911 to organize the Fischer-Sweeney Bronze Co.

**Charles H. Penny,** purchasing agent for the Crane Co., Chicago, died October 20, at his home in Park Ridge Ill. He was 58 years old.

**Charles T. Allen,** founder of the American Steam Pump Co., and Union Steam Pump Co., Battle Creek, Mich., died October 31, at his home in Battle Creek. Mr. Allen was 67 years old and had been prominent in industrial circles in Battle Creek for more than 30 years. He leaves a widow and one daughter.

### Miscellaneous Notes.

**Central Supply Association,** at its meeting in Chicago, October 28, adopted a resolution to the effect that whenever any manufacturer brands his goods as to capacity, size or weight, he should brand them the exact capacity, size or weight. It is well known to the trade that already laws have been passed in five States relative to the truthful and exact branding of goods and the resolution was adopted for the protection of the wholesaler, retailer and the public. The secretary was instructed to take up the matter with the national committee and ask its cooperation. It was also resolved that since frequent changes of lists on the part of manufacturers is detrimental to the trade, all manufacturers contemplating the change of any lists be requested to make such changes on or before January 1, 1915, and that such lists in existence on January 1, 1915, be continued until January 1, 1920, and thereafter no changes shall be made excepting at the termination of five-year intervals. Officers were elected as

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follows: President, C. V. Kellogg, Kellogg-Mackay Co.; first vice-president, P. J. Frey, Central Supply Co.; second vice-president, A. A. Merkel, Merkel Bros. Co.; treasurer, Edw. F. Niedecken, Hoffman & Billings Co.; secretary, Paul Blatchford, 1915 City Hall Square Building, Chicago. Executive committee: C. V. Kellogg, P. J. Frey, A. A. Merkel, Edw. F. Niedecken, William Ivy, Monument Plumbing & Supply Co.; George H. Gorton, W. B. Youngs Sons Co.; J. B. Rahm, U. S. Supply Co.; A. V. Conradt, Western Pottery Co., and E. A. Morris, Detroit Lead Pipe Co. National Committee: J. J. Ryan, J. J. Ryan & Co.; W. A. Myler, Standard Sanitary Mfg. Co.; John F. Wolff, L. Wolff Mfg. Co.; F. D. Keeler and George H. Bailey, Bailey-Farrell Co. Addresses were made by Frank Stockdale on "Keeping Up with Rising Costs," and by Grosvenor Dawe, editor of "Dawe's Federalist," on "The Business Man and Public Affairs." The next meeting of the association will be held in Chicago in February, 1915.

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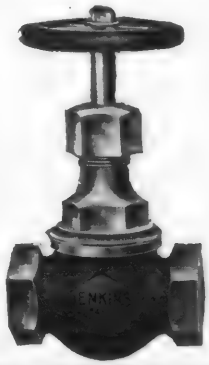

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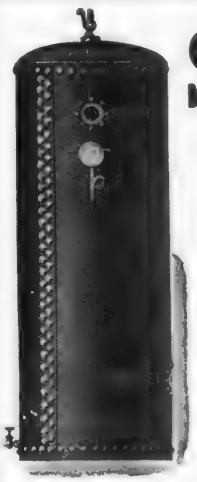

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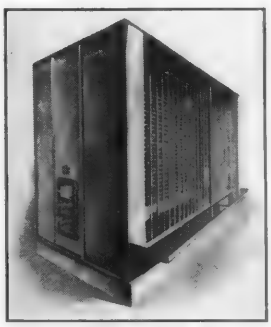

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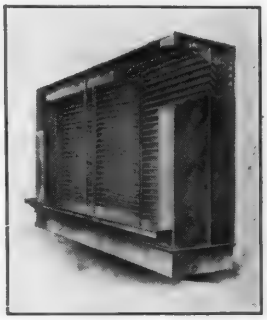

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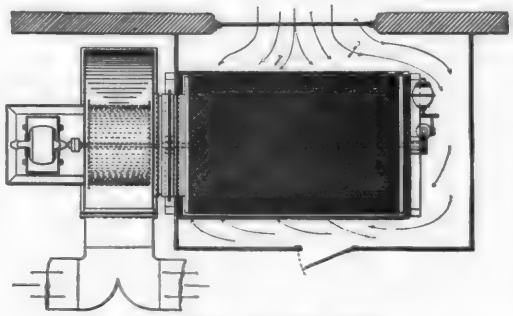

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are the most efficient for cleansing the air and for removing all foreign matter that comes in with the air. Dirt deposits in bottom of tank do not come in contact with the air, as with the ordinary spray washers that recirculate the muddy water through the incoming air, thus causing unhealthy atmospheres.

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The cost of operating this washer is very slight, taking nine-tenths less H. P. than any other purifier (example, a 50,000 cu. ft. purifier requires 1 H. P.).

A substantial test was made at the Pennsylvania Railroad Station, Pittsburgh, Pa., by the Railroad Company, where the local air is heavily filled with carbon from coal, and this washer removed 99% of impurities, depositing the carbon in the bottom of the tank for removal.

This apparatus is manufactured at our own works, size to suit conditions. Plans furnished for ventilating plants, with air purifier combined.

**Write for descriptive Circular.**

**WELLS AND NEWTON COMPANY**

**Avenue B & 17th Street, New York City**

of the city building at a rate of $324.10. The franchise granted to the company provided for free heat for the city building and the Culver Union Hospital. It is stated that if the council finds it impossible to continue to obtain heat without cost from the heating plant, it will install individual plants in the two buildings.

**Indianapolis, Ind.**—Joseph G. Hayes, a well-known heating contractor and a member of the American Society of Heating and Ventilating Engineers, was elected Commissioner of Marion County at the recent election in Indiana.

**Chicago, Ill.**—As a result of a chancery court ruling in Chicago, the Chicago Health Department has gained a victory in its enforcement of the ventilation ordinance in that city for the ventilation of moving picture theatres. The announcement, which is made in the weekly bulletin of the health department, states that the case was that of the Washington Theatre at 4320 Cottage Grove Avenue. The theatre was closed by the department in September, 1913, after the management had refused to provide proper ventilation. The owner, backed by the Moving Picture Exhibitors' League, obtained an injunction restraining the city from enforcing the ordinance until its validity was tested. The decision, which was handed down September 22, upholds the contention of the department and the provisions of the ordinance.

**Cleveland, O.**—In connection with the steam heating franchises asked by the Cleveland Electric Illuminating Company, the ordinances now before the council permit the company to extend heating mains along Huron Road, Vincent Avenue and Walnut Avenue. The council had already granted authority to lay mains along Walnut Avenue to furnish heat to the Moose Club, but defeated the other two grants intended to supply downtown business firms. The Walnut Avenue grant was later reconsidered and the franchises for the three streets included in one ordinance. An amendment by Councilman Gahn provided for the appointment of a board of arbitrators to fix the purchase price of heating mains in case the city decides to go into the heating business. Steam grants given the Illuminating company by the council were upheld at a referendum two years ago and the extensions are considered, from one point of view, as but a part of the original grant.

### Manufacturers' Notes.

**Consolidated Engineering Co.**, Chicago, has opened a new branch office in Cincinnati, O., in charge of William Schulteis.


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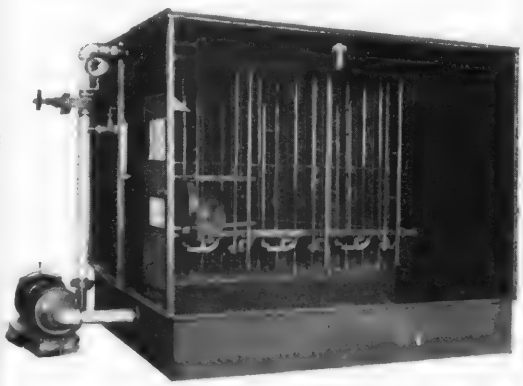

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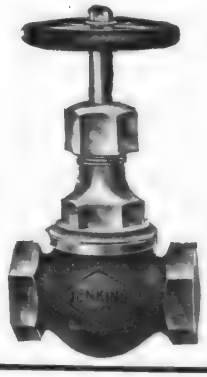

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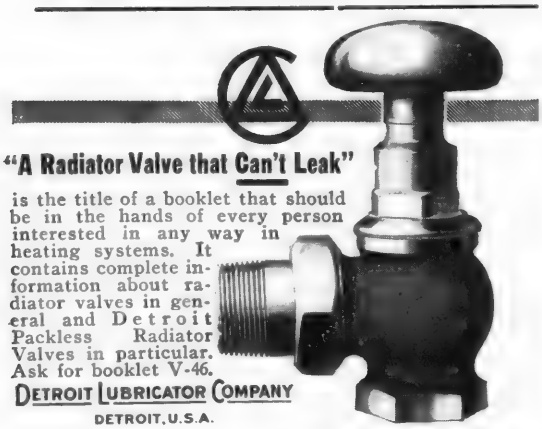

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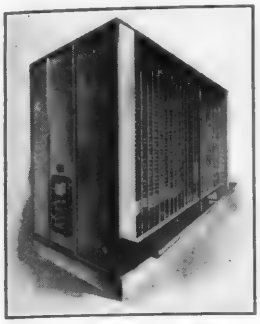

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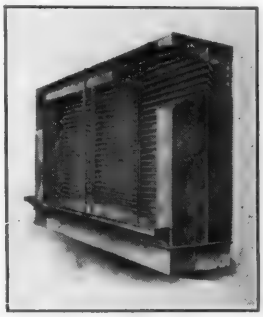
# WEBSTER Air Conditioning APPARATUS

is designed and built to meet the individual requirements of each installation.



Webster "Standard" Air Washer

NO ONE TYPE of apparatus is best suited for all kinds of service, but for each condition such as Air Cleansing, Air Cooling, Humidifying, etc., there is a type of Webster Air Conditioning Apparatus that is most effective for the specific service.

For this reason more satisfactory results can be secured than is possible with a type that has been designed in an attempt to meet all conditions.

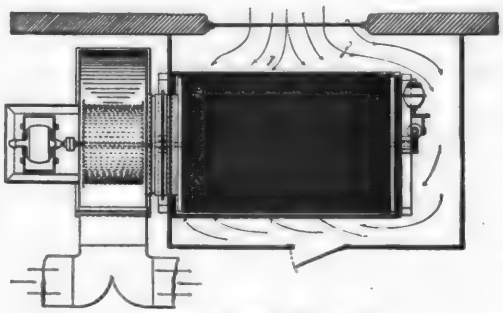
While Webster Air Conditioning Apparatus is made in several types, each type is of the same high class design—constructed of the same high class material and workmanship—a standard that is always maintained.

Consult us before writing your next specification.

**WARREN WEBSTER & COMPANY, CAMDEN, N. J.**

**Established 1888** **24 Branch Offices**

## WE CAN CONVINCE YOU THAT



Patented April 13, 1912.
Plan View

# The KINGWELTON Rotary Air Purifiers

are the most efficient for cleansing the air and for removing all foreign matter that comes in with the air. Dirt deposits in bottom of tank do not come in contact with the air, as with the ordinary spray washers that recirculate the muddy water through the incoming air, thus causing unhealthy atmospheres.

## ESPECIALLY RECOMMENDED FOR PRIVATE HOUSES

The cost of operating this washer is very slight, taking nine-tenths less H. P. than any other purifier (example, a 50,000 cu. ft. purifier requires 1 H. P.).

A substantial test was made at the Pennsylvania Railroad Station, Pittsburgh, Pa., by the Railroad Company, where the local air is heavily filled with carbon from coal, and this washer removed 99% of impurities, depositing the carbon in the bottom of the tank for removal.

This apparatus is manufactured at our own works, size to suit conditions. Plans furnished for ventilating plants, with air purifier combined.

**Write for descriptive Circular.**

**WELLS AND NEWTON COMPANY**

**Avenue B & 17th Street, New York City**

of the city building at a rate of $324.10. The franchise granted to the company provided for free heat for the city building and the Culver Union Hospital. It is stated that if the council finds it impossible to continue to obtain heat without cost from the heating plant, it will install individual plants in the two buildings.

**Indianapolis, Ind.**—Joseph G. Hayes, a well-known heating contractor and a member of the American Society of Heating and Ventilating Engineers, was elected Commissioner of Marion County at the recent election in Indiana.

**Chicago, Ill.**—As a result of a chancery court ruling in Chicago, the Chicago Health Department has gained a victory in its enforcement of the ventilation ordinance in that city for the ventilation of moving picture theatres. The announcement, which is made in the weekly bulletin of the health department, states that the case was that of the Washington Theatre at 4320 Cottage Grove Avenue. The theatre was closed by the department in September, 1913, after the management had refused to provide proper ventilation. The owner, backed by the Moving Picture Exhibitors' League, obtained an injunction restraining the city from enforcing the ordinance until its validity was tested. The decision, which was handed down September 22, upholds the contention of the department and the provisions of the ordinance.

**Cleveland, O.**—In connection with the steam heating franchises asked by the Cleveland Electric Illuminating Company, the ordinances now before the council permit the company to extend heating mains along Huron Road, Vincent Avenue and Walnut Avenue. The council had already granted authority to lay mains along Walnut Avenue to furnish heat to the Moose Club, but defeated the other two grants intended to supply downtown business firms. The Walnut Avenue grant was later reconsidered and the franchises for the three streets included in one ordinance. An amendment by Councilman Gahn provided for the appointment of a board of arbitrators to fix the purchase price of heating mains in case the city decides to go into the heating business. Steam grants given the Illuminating company by the council were upheld at a referendum two years ago and the extensions are considered, from one point of view, as but a part of the original grant.

### Manufacturers' Notes.

**Consolidated Engineering Co.,** Chicago, has opened a new branch office in Cincinnati, O., in charge of William Schulteis.

The Economical
Vapor System

This ingenious valve instantly turns any steam heating system into a perfect vapor system.
Noiseless, leakproof, foolproof!
A real revolution in air valves!
Look into it!

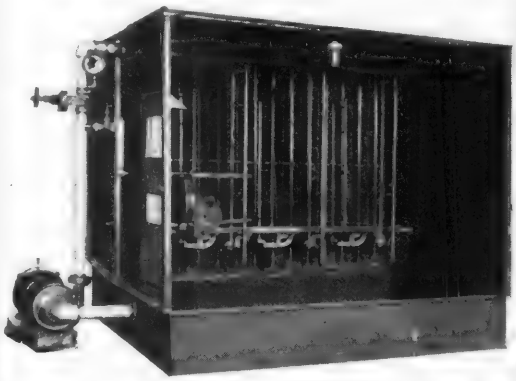
KOALSAVE VACUUM AIR VALVE

Descriptive leaflet sent upon request.

Koalsave Vacuum Valve Co.
2554 Park Row Building
New York

Air Washing and Cooling for THEATRES

Our theatre installations prove the "ACME" way gives desired results for Washing and Cooling.



Iroquois Engineering Co.
Manufacturers—"ACME" Air Washers,
CHICAGO, ILL.
Representatives in all principal cities.

# NOZZLES THAT WILL NOT CLOG

One of the chief features of the Sturtevant Air Washer is that the nozzles will not clog. The orifices are large. No adjustments are necessary. No packing is used and the spray is perfect.

## Sturtevant Air Washers

REG. U. S. PAT. OFF.

have been installed in many of the most modern and up-to-date buildings. This is because the heating and ventilating engineers have realized their superior mechanical and operating features.

Our air washers are in such buildings as the Bancroft Hotel, Worcester, St. Paul's Hospital, Vancouver, and the Standard Oil Building, San Francisco.

We cannot tell all the desirable details here but catalog 225-V will be sent on request.

## B. F. Sturtevant Company

**Hyde Park, Boston, Mass.**
**and All Principal Cities of the World**

Announcement is also made that the company's New York office has been moved to 114 Liberty Street, with Roland B. Hall, Jr., formerly representing the company in Atlanta, Ga., in charge.

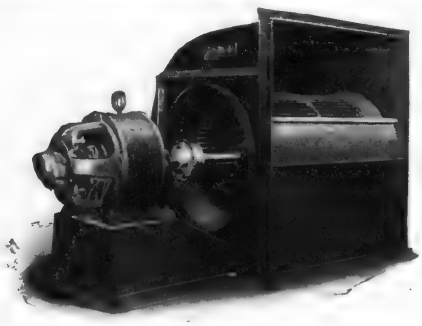
**Pressed Metal Radiator Co.,** Pittsburgh, Pa., announces that the United States government, after two years' investigations, has revised its building specifications, so that pressed metal radiators will be specified alternately with cast-iron for all government work.

**Hoffman Heater Co.,** Lorain, O., manufacturers of domestic water heaters, announces an increase in its capital stock of $100,000.

**Ilg Electric Ventilating Co.,** Chicago, has leased property near its present quarters at Whiting and Wells Streets for a 20-year term at $12,000 a year, or a total rental of $240,000. The company is planning to put up a large building on the site for the manufacture of its line of fans, blowers and other heating and ventilating apparatus. A branch office for the sale of Ilg apparatus has recently been opened in Philadelphia, at 122 North Franklin Street, in charge of C. A. Anderson. Washington and Baltimore business will be handled from the Philadelphia office. Announcement is also made that the company has added a motor department to its factory and is now building two and three phase motors for its own use and expects to put out a standard line in a short time. The Ilg Company is particularly well equipped to build these machines in the special low speeds required by fan manufacturers.

**Thermo Boiler and Radiator Co.,** manufacturers of gas hot water heaters and other heating apparatus, has established its factory and warehouse at Oakland, Cal. Included in the company's product is an automatic radiator system of heating which is accomplished by means of a double system, the copper coils operating in conjunction, yet entirely independent of each other. The thermostatic gas regulator is adjusted to produce and maintain any degree of that desired for domestic use as well as in the radiators. The company is arranging to place agencies throughout the United States.

**American Radiator Co.,** Chicago, Ill., has declared a quarterly dividend of 1¾% on the company's preferred stock, and a dividend of 2½% on the common stock, for the quarter ending Nov. 16 and Dec. 22, respectively.

# Reasons Why

## You should specify---

"Sirocco"
TRADE MARK.

## Multi-Blade Fans and Blowers

1. **Because** they handle twice as much air, consuming less power than paddle wheel fans of same wheel diameter.
2. **Because** their design makes it possible for every bit of energy consumed; produce the maximum amount of air.
3. **Because** their high mechanical efficiency keeps their upkeep costs down to the minimum.

Bulletin No. 109 will be mailed at your request.

AMERICAN BLOWER COMPANY

DETROIT. MICHIGAN. U.S.A.

*Please mention* THE HEATING AND VENTILATING MAGAZINE *when you write.*

# Many People Do Not Realize the Vast Proportions of Our Business

They know that the name

**Sturtevant**
(REG. U. S. PAT. OFF.)

is synonymous with **"FANS"** and that Sturtevants are the largest manufacturers in the world of Fans, Heating and Ventilating Apparatus but they do not know of our other products.

Our other products are not experiments but are in universal use all over the globe.

We make Engines, Generating Sets, Turbines, Economizers, Drying Apparatus, Mechanical Draft Apparatus, Motors, Steam Traps, Air Washers and other less important lines.

These products are described in 70 catalogues and bulletins. We have a concentrated description of them in our General Catalog just published.—Catalogue 195-V.

**B. F. STURTEVANT CO., Hyde Park, Boston, Mass.**
**and All Principal Cities of the World**

**International Steam Pump Company's** bondholders' protective committee announces that over 60% of the outstanding bonds have been deposited with the committee and that the committee hopes to be in a position at an early date to announce a plan for a reorganization.

**Frank L. Patterson & Co.,** New York, report that the State of Pennsylvania has just opened its third tuberculosis sanatorium at Hamburg, which is probably one of the most up-to-date institutions of its kind in the country. Eight Patterson hot water heaters were installed in the various buildings to furnish hot water to the laundry, house and kitchen supply.

**Alberger Heater Co.,** Buffalo, N. Y., announces that it has secured the contract for all of the heaters required in the Brooklyn Hospital installation, in Brooklyn, N. Y. The various buildings are to be heated by means of a forced circulation hot water system. The two heaters for this work will each have a capacity for heating 1,500 gals. of water per minute from an initial temperature of 160° F. to a final temperature of 180° F., using steam at atmospheric pressure. In addition to the above, there will be installed four hot water service or domestic supply heaters, three of which will be used for supplying hot water to the various buildings and the fourth for laundry purposes. The water spaces of all of these heaters are to be lined with copper to prevent any possibility of rust getting into the water.

### New Firms and Business Changes.

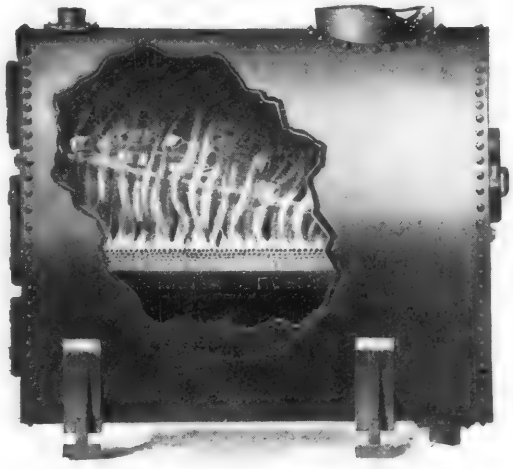
**Baker & Wetherill,** Muncie, Ind., has been organized by O. E. Baker and A. B. Wetherill, with offices at 200 North Walnut Street, to conduct a heating and plumbing business.

**Arex Company,** Chicago, Ill., is the new name of the business heretofore conducted under the name of J. C. Kernchen, manufacturer of the Arex ventilators. The president of the company is J. C. Kernchen and it is announced that Joseph H. Everston, a ventilating engineer, has joined the company's organization.

### Business Troubles.

W. W. Campbell & Son, Boston, Mass., heating and plumbing contractors, have failed with liabilities at $39,100 and assets at $50,959. The firm was composed of Walter W. Campbell, of Malden, Mass., and Raymond F. Campbell, of Portland, Me.


# *You kill two birds with one stone*



When you install a

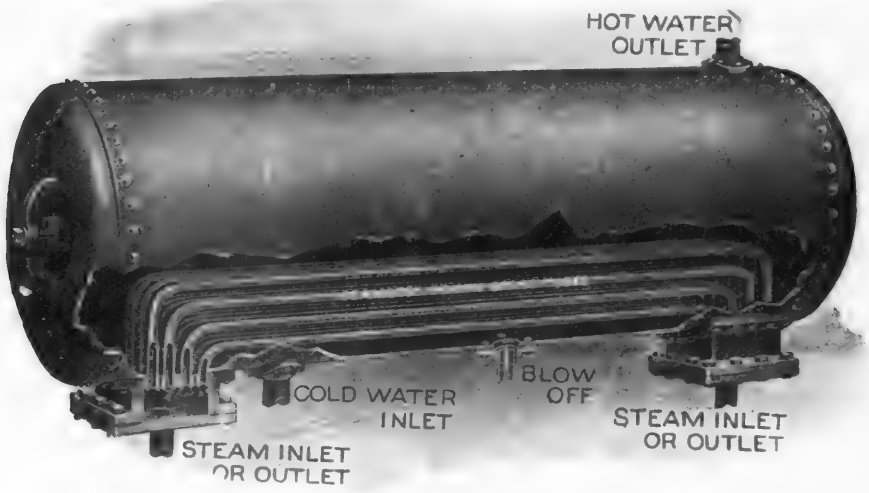
## Sims Water Heater and Garbage Burner

You dispose of your garbage and you transform it into fuel.

No troublesome features. They have all been taken care of. No offensive odors, no nuisance, unburnable refuse easily removed, tubes readily cleaned. Heating capacities from 150 to 3,200 gals. water per hour.

**Full particulars in Bulletin H-G. B., No. 3. Send for it.**

**THE SIMS COMPANY, 18th Street, Erie, Pa.**




Patented Aug. 26 1913

**TYPE C**

## THERE IS NO IDLE HEATING SURFACE
**IN THE**

# PATTERSON
# HOT WATER TANK

**for heating water for domestic or manufacturing purposes**

When steam enters the **Expansion Chamber,** it expands and uniformly fills the tubes, whose combined cross-sectional area is several times that of the steam pipe. As rapidly as the steam condenses, due to transmitting its heat to the surrounding water, it is discharged into the **Condensation Chamber.**

The Condensation Chamber has sufficient area to provide for any sudden increase of condensation without permitting it to back up into the tubes to destroy their heating efficiency.

The heating surface in the Patterson Tank consists of a number of parallel seamless drawn brass tubes, both ends of each being expanded into heavy cast iron tube-heads with an improved roller expander. Their ∩ shape provides for the free contraction and expansion of each individual tube without straining, so there is no danger of leakage.

Any combination of storage and heating capacities can be furnished.

# FRANK PATTERSON & CO.

**26 CORTLANDT STREET, NEW YORK**

*Representatives in All Principal Cities*

*Please mention* THE HEATING AND VENTILATING MAGAZINE *when you write.*

**New Incorporations.**

**Stack Heater Co.,** Boston, Mass. Incorporators: Chetwood Smith, Robert Rand, Elmer S. Stack.

**Economy Oil Heating Co.,** New Albany, Ind., capital $10,000, to manufacture and sell oil burners. Incorporators: A. D. Flishman, L. C. Mount and M. M. Mount.

**Economy Heating & Plumbing Co.,** Kansas City, Kan., capital $2,000. Incorporators: A. B. Shanson, N. L. Harrison and E. W. Freschlag.

**Joseph A. Langdon & Sons Co.,** Pittsburgh, Pa., capital $10,000, to conduct a heating and ventilating business. Incorporators: James A. Milholland and Joseph A. Beck, of Pittsburgh, and Paul A. Stuart, of Cheswick.

**Frey Bros.,** Newark, N. J., capital $10,000, to deal in heating and plumbing supplies. Incorporators: Amelia Frey, E. L. Frey and K. J. Frey, all of Newark.

**Maryville Electric & Plumbing Co.,** Blount County, Tenn., capital $10,000. Incorporators: J. L. Clark, K. P. Jones, James V. Hopkins, Frank E. Keener and C. A. Doyle.

**Detroit Specialty Co.,** Detroit, Mich, capital $15,000.

**Flanner Boiler & Tube Co.,** Toledo, O., reorganized with a capital of $40,000. Treasurer and general manager, D. D. Flanner. The company will erect a new building at Akron.

**United Screen Ventilator & Window Co.,** Dover, Del., capital $1,000,000. Incorporators: Frank R. Halsell, Philadelphia, and others.

**Pennsylvania Air Conditioning Co.,** Pittsburgh, Pa., capital $5,000, to manufacture ventilating systems. Incorporators: W. H. Sproull, C. F. Morrow and C. Heiser.

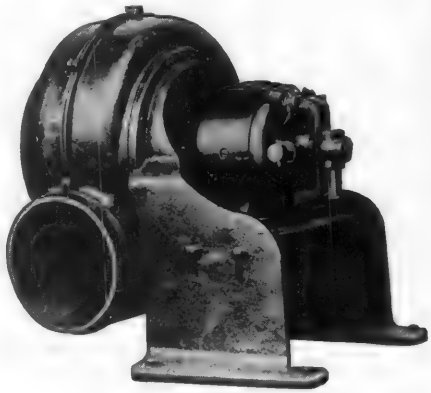
**Adkins-Wilsey Co.,** Chicago, Ill., capital $100,000, to manufacture heating specialties. Incorporators: Frank Adkins, Irven H. Wilsey and Walter H. Green.

**American Insulation Co.,** Philadelphia, Pa., capital $25,000, to manufacture pipe and boiler coverings. Incorporators: J. W. Latchum, Philadelphia; A. B. Magee and W. D. Burton, both of Dover.

**Shesler Co.,** Bound Brook, N. J., capital $25,000, to manufacture heating and plumbing specialties. Incorporators: L. P. Shesler, H. W. Shesler and J. J. Shesler.

**Simplex Ventilating Co.,** Jerseyville, Ill., capital $5,000, to manufacture ventilators. Incorporators: T. W. Butler, F. D. Heller and A. A. Shobe.

**Welch Bros. Co.,** Lowell, Mass., capital $10,000, to take over the heating and plumbing business of Welch Bros., of that place. President, John F. Welch; treasurer, Rich-

**Westinghouse-Sirocco Blowers**

are especially designed for forcing air through pipes or against resistance to its passage.

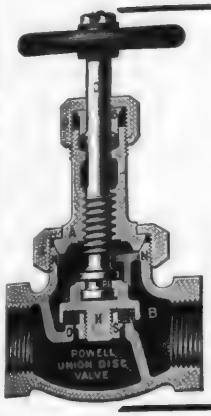
Many ventilating problems can be easily solved by means of these little blowers.

They are compact, easily installed, quiet in operation, and very efficient.

The blower wheel is of the well-known Sirocco design and construction and is able to handle large volumes of air at considerable pressure.

Made in sizes of from 175 to 700 cubic feet of air per minute. Send for publication giving full description, dimensions and prices.

**Westinghouse Electric & Manufacturing Co.**
**East Pittsburgh, Pa.**




# POWELL VALVES

FOR HOT WATER OR STEAM HEATING

**Five Points of Efficiency Combined in the POWELL Union Composite Disc Valves**

1. Body symmetrically designed and well-proportioned. 2. Metal distributed to meet most wear. 3. Union bevel ground joint connection between body and bonnet, red lead or cement unnecessary to make them tight. 4. Disc-holder "H" permits the use of any make of rubber discs. 5. All parts made to gauge and are interchangeable.

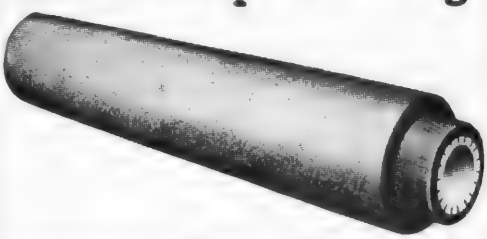
Ask your dealer for "POWELL" VALVES or write us.

THE WM POWELL CO.

DEPENDABLE ENGINEERING SPECIALTIES

CINCINNATI, O.

# STANDARD Steam Pipe Casing



Above cut illustrates the completion of our tin lined

**STEAM PIPE CASING**

We also make unlined casing.

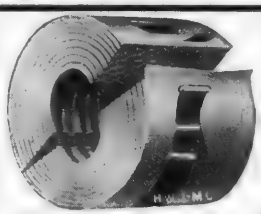
FOR

**Insulating Underground Steam Pipes**

Write for CATALOG and PRICES.
We furnish all SPECIALS required.

**Standard Wood Pipe Co.**

**Williamsport, Penna.**



*These are the reasons why your customers will save money if you install*

# J-M Asbestocel Pipe Covering

"In ordinary air cell coverings, the channels run lengthwise with the pipe. This gives the air a chance to circulate in long tubes. In J-M Asbestocel the air cells run **around** the pipe. The channels are **shorter, narrower,** and **sealed air-tight.** Therefore, all the air confined in each of these hundreds of little cells is 'dead.' And 'dead' air is the best insulation known. Install J-M Asbestocel for your customers' steam or hot water pipes and you will be responsible for their saving fully a third on the cost of their fuel."

**Write nearest branch for "Asbestone" sample and booklet.**

**H. W. JOHNS-MANVILLE CO.**

| | | | |
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| Atlanta | Detroit | Newark | San Francisco |
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(2712)

BETWEEN THE TWO COVERS OF

# Scientific Building Operation

**you will find a half hundred articles written by the best authorities on building management in this country. Here are some of the subjects:**

**RENTING—ACCOUNTING—REPORTS—OPERATION METHODS—OPERATING COSTS PURCHASING SUPPLIES—ELEVATORS—LIGHTING—INSURANCE—FLOOR LAYOUTS**

Our special price to subscribers of **Buildings** and Building Management is $2.00 delivered to you. Otherwise, $2.50. **Buildings** and Building Management for one year and Scientific Building Operation, $4.00.

**PATTERSON PUBLISHING CO., 918 City Hall Square Building, Chicago**

ard J. Welch, a former director of the National Association of Master Plumbers. James J. Kerwin is also a member of the corporation.

**Western Valve Co.,** 188 North Market Street, Chicago, Ill., capital $100,000. Incorporators: H. V. Conine, A. M. Ashcraft and Charles D. Rathbun.

**Foley Supply Co.,** Syracuse, N. Y., capital $5,000, to conduct a heating and plumbing business. W. P. Hewitt is the principal stockholder.

### Contracts Awarded.

**New York Blower Co.,** Chicago, Ill., heating and ventilating Livingston Hotel, at Grand Rapids, Mich.

**Cross Hardware Co.,** Monticello, Ia., heating new Roman Catholic Church building at that place. A Mouat-Squires vapor heating system will be installed.

**Prox & Burget,** Terre Haute, Ind., heating, ventilating, plumbing Indiana State Normal School at Terre Haute. The heating and ventilating contract amounts to $10,200 and the plumbing contract to $4,200.

**P. J. Lavan,** Seattle, Wash., was low bidder, at $33,250, for the heating of the Ballard High School, at Seattle. Other bids were: W. B. Allen, $33,618; F. W. Beck & Co., $33,648; Ernst Hardware & Plumbing Co., $34,401; Rautman Plumbing & Heating Co., $34,401; Eckart Plumbing & Heating Co., $36,215; Ward & Scherer, $36,401; and West Coast Heating Co., $37,461. The three low bids on the heating work were held for further consideration.

**George Kispert,** South Kaukauna, Wis. heating and plumbing Most Precious Blood school building at New London, for $6,000.

**Oliver & Howland Co.,** Springfield, Mass., heating new building on Hillman Street for Meekins, Packard & Wheat.

**Hoagland-Hulse Co.,** San Bernardino Cal., heating new $250,000 polytechnic high school at San Bernardino for $19,972.


MOUAT Graduating Vapor Heating System

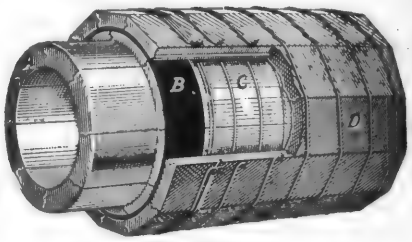
**SELL THIS SYSTEM**

**Why?** Because you can sell it quicker—sell it to more people—eliminate complaints—and make each customer a walking advertisement for you.
**Why?** Because The Mouat System combines a number of exclusive features never before obtainable in a Heating System.
Write for booklet and our generous Proposition to Heating Contractors.

THE MOUAT-SQUIRES COMPANY
1244 W. 4th St. Cleveland, O.

MILD HEALTHFUL HEAT
When You Want It
Where You Want It
In Just the Right Amount






A—Inner Shell, 2 inches thick.
B—Asphaltum Packing.
C—Dead Air Space.
D—Outer Shell, 1 inch thick.

# Cover Your Steam Pipes

WITH WYCKOFF'S IMPROVED

# CYPRESS COVERING

*Made of Gulf Cypress, the wood eternal*

Not affected by wet and dry conditions common to steampipe trenches. Will not rot. Lasts twice as long as Pine Casing. Absolutely water and steam tight. Each shell is wound with heavy galvanized wire. Coated all over with the best known preservative—Hydrolene B.

Let us answer your questions and tell you all about it. Booklet on request.

## A. WYCKOFF & SON COMPANY

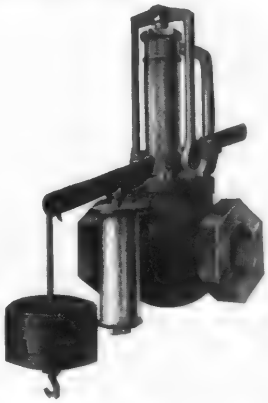
**ELMIRA . . N. Y.**

**Chicago, Ill., 551 West 14th Place**

# DAVIS VALVES

*for the*

## Automatic Regulation of Pressure



Automatic Valve Specialties play an important part in the operation of most every high pressure steam plant. They are installed to perform certain functions and their failure quite often means interruptions, delays and expense.

For nearly forty years Davis Valves have been held in high esteem by men of experience who specify, install and use valve specialties.

We make—

**Pressure Regulators**
**Balanced Valve**
**Float Valve**
**Steam Trap**
**Back Pressure Valve**
**Exhaust Relief Valves**
**Stop and Check Valves**
**Pump Governor**
**Condensation Receiver**
**Damper Regulator**
**Vacuum Pump Governor**
**Radiator Air Valves**

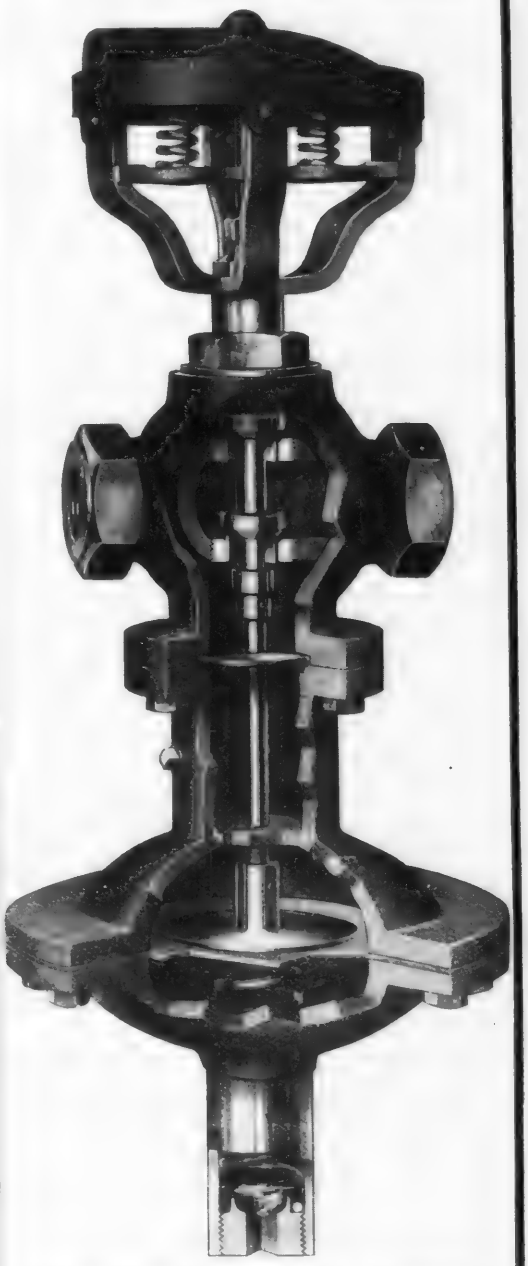
When you are again in the market, try Davis Valves. Their efficiency will please you.

**G. M. Davis Regulator Company**

***436 Milwaukee Ave., Chicago***

***J. C. HORNUNG, Engineer***

***111 West Monroe St., Chicago***



*Pressure and Temperature Regulators for either Steam or Hot Water*

*These Valves are furnished with or without the temperature control. Fully* 500 *valves in use and* ***not one*** *Failure.*

**Wanted.**

Twenty-five cents each will be paid for the following back numbers of The Heating and Ventilating Magazine:

Vol. 2, 1905, Nos. 2, 6 and 8.
Vol. 3, 1906, No. 3.
Vol. 6, 1909, No. 9.

Address Garrison, care of Heating and Ventilating Magazine.

**Position Wanted.**—Have had ten years' experience as fan engineer and salesman, and three years in heating contractor's office as estimator and engineer. Am married man, 32 years old. Prefer sales work in eastern States. Address Sales Engineer, care of Heating and Ventilating Magazine.

**Position Wanted.**—Mechanical engineer, engaged in architect's office, would like change. Widely experienced in designing power plants; heating, ventilating and plumbing systems for large schools, public and office buildings. A1 references. Address Mechanical, care of HEATING AND VENTILATING MAGAZINE.

**Sales Engineer.**—Manufacturer of fans, air conditioners, heating, drying or kindred apparatus or systems, desiring competent representation in Chicago field, can get in touch with successful sales engineer with large following in this territory, and who is in a position to devote all or part of his time to your line, by addressing Sales Engineer, care of HEATING AND VENTILATING MAGAZINE.

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Statement of the ownership, management, etc., of THE HEATING AND VENTILATING MAGAZINE, published monthly at New York, N. Y., required by the Act of Aug. 24, 1912.

*Name of* *Post-Office Address.*

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*Managing Editor*, none.
*Business Manager*, Gustave Petersen, 1123 Broadway, New York.
*Publisher*, Heating and Ventilating Magazine Co., 1123 Broadway, New York.
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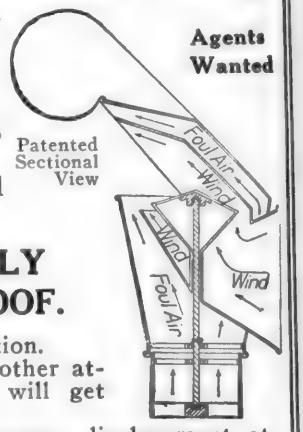
(Signed) A. S. ARMAGNAC, Editor.
*Sworn to and subscribed before me this 30th day of September*, 1914.
(Seal) (Signed) A. L. SCANTLEBURY, No. 64.
Notary Public, Kings County, Certificate filed in New York County.
(*My commission expires March 31, 1915.*)

**American Standard Automatic Air Pump**

Having a Special NO-DOWN-DRAFT feature, it insures a steady upward pull at all times.

**Agents Wanted**

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**ABSOLUTELY STORM PROOF.**

Needs no attention.
Has no fans or other attachments that will get out of order.
Will give an average displacement at the rate of over 1000 linear feet per minute.

**Specified by the New York and Massachusetts Boards of Education.**

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**Spencer Turbine Vacuum Cleaners**

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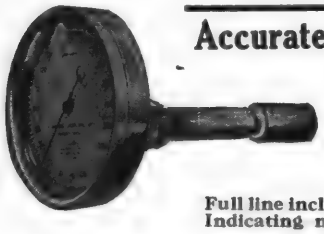

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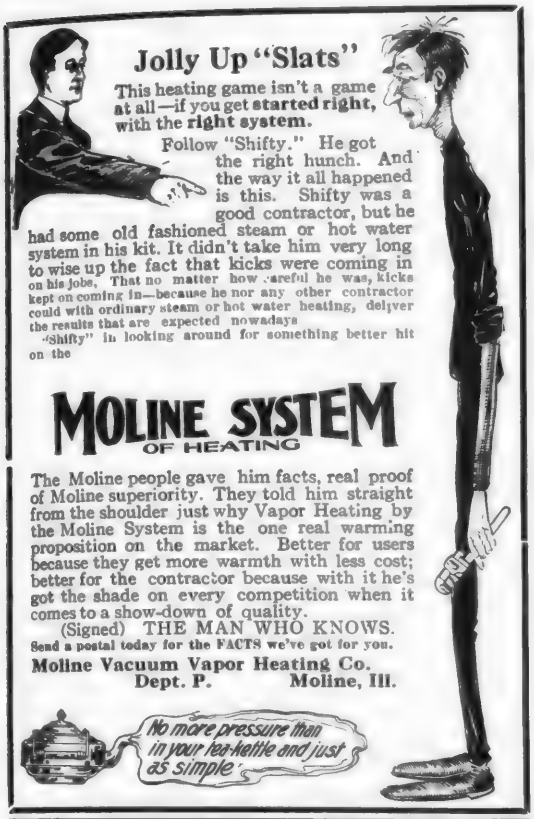
**Full line includes seven types of recording thermometers and a special line for mechanical uses. Indicating mechanical thermometers are furnished with extensions from 2 to 30 in. in length.**

**All thermometers are double and not breakable.**

**STANDARD THERMOMETER COMPANY** Clinton and Shirley Streets **BOSTON, MASS.**



## Jolly Up "Slats"

This heating game isn't a game at all—if you get **started right,** with the **right system.**

Follow "Shifty." He got the right hunch. And the way it all happened is this. Shifty was a good contractor, but he had some old fashioned steam or hot water system in his kit. It didn't take him very long to wise up the fact that kicks were coming in on his jobs. That no matter how careful he was, kicks kept on coming in—because he nor any other contractor could with ordinary steam or hot water heating, deliver the results that are expected nowadays

"Shifty" in looking around for something better hit on the

## MOLINE SYSTEM
OF HEATING

The Moline people gave him facts, real proof of Moline superiority. They told him straight from the shoulder just why Vapor Heating by the Moline System is the one real warming proposition on the market. Better for users because they get more warmth with less cost; better for the contractor because with it he's got the shade on every competition when it comes to a show-down of quality.

(Signed) THE MAN WHO KNOWS.

**Send a postal today for the FACTS we've got for you.**

**Moline Vacuum Vapor Heating Co.**
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*No more pressure than in your tea-kettle and just as simple*

## Boiler Copings and Foundation Caps for Motors, Pumps, Fans and Blowers

**Estimates Furnished on Blueprints**

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**PIPE JOINT COMPOUND**

Never sets or hardens, but permits a joint to be opened with ease, no matter of how long standing.

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**Made in JERSEY CITY, N. J., by the**

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**Established 1827**

## Right in your own plant

the condensation in your steam apparatus can be returned to your boiler as high as 330 degrees Fahr. without using a pump and on 90 per cent. less steam.

Yes sir, that present condensation waste can be turned into a profit with a

## Morehead
**Back to Boiler**
## SYSTEM

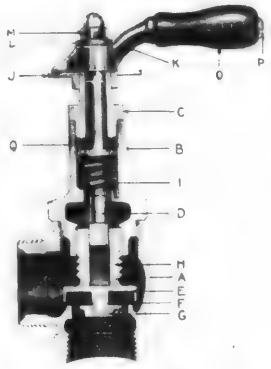
What does this suggest to you? Can't you see the real economy in returning the condensation while it's **hot**—before it has a chance to cool in a receiver or hot well? Can't you see the expense of depending upon pumps that cannot lift water hotter than 212 degrees Fahrenheit? Then there's no better time to act than ***right now.***

**Whatever the size of your plant the MOREHEAD SYSTEM can save you money. Let us tell you why. No obligations. Write us today.**

## Morehead Mfg. Co.
**Heating Department**
**Detroit - Michigan**

248

***Compliments of the Season***




Style No. 32

| | |
|---|---|
| A—Body | J—Dial Plate |
| B—Bonnet | K—Lever |
| C—Top | L—Stem Nut |
| D—Stem | M—Stem Lock Nut |
| E—Disc Holder | O—Wood Handle |
| F—Disc | P—Screw |
| G—Disc Nut | Q—Stem Steam Seat |
| H—Disc Carrier | |
| I—Spring | |

# IS IT WORTH WHILE?

Most people unconsciously ask this question of themselves when they are considering the use of an article they are not very familiar with, and, ten chances to one, it will go unanswered unless some one forces them to make a decision.

This cut sectional view of the

## SYRACUSE PACKLESS RADIATOR VALVE

with graduated dial and lever handle will enable you to see at the first glance the SIMPLICITY of its construction and the well proportioned body metal lines.

You will be further interested to know that we will send you

A CUT SAMPLE postpaid for your careful examination. Give us your answer promptly.

ARCHITECTS, SEE SWEET'S, PAGE 1227

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**Investigate this splendid line of MUELLER Reducing and Regulating Valves.**

The best all around valve on the market

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**A Valve for Every Pressure**

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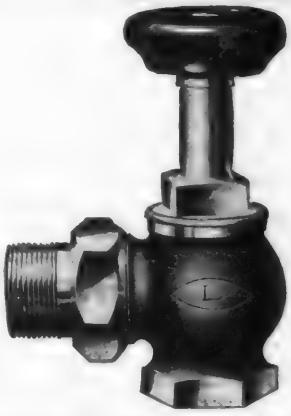
Take the matter up with us—get our No. 5 Catalogue. If you have an annoying pressure problem take it up with our experts. They will be pleased to advise with you.

**All MUELLER VALVES are Unconditionally Guaranteed When Installed According to Our Directions. Write for No. 5 Catalogue. Do it today.**

**H. MUELLER MFG. CO., Decatur, Illinois.**

New York San Francisco

# A Positive Proposition



LAVIGNE PACKLESS VALVES ARE THE ANSWER to the demand for an efficient method of controlling heat in vapor vacuum or central heating systems, and they have been proven thoroughly satisfactory during a number of years' exhaustive tests in actual service.

They **positively will not leak** air, water or steam.

They **positively completely open** or completely close with but 7-8 turn of the handle.

They **positively are not** an experiment.

When specifying, installing or using a steam heating plant, insist on having

## LAVIGNE PACKLESS QUICK-OPENING STEAM RADIATOR VALVES

**Built right—To stay tight.**

Made up in six sizes, in Wood Wheel Handle, Graduated Handle Plate, Lever Handle, Extension Handle, Lock Shield, and Right and Left Corner Styles.

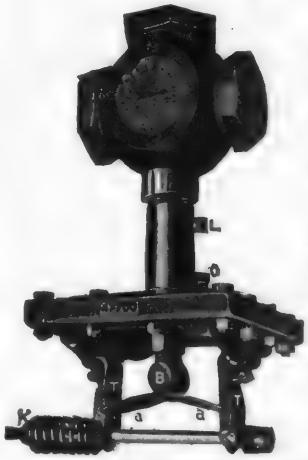
**Ask your Jobber, or write for details.**

**LAVIGNE MANUFACTURING CO., Detroit, Mich.**

**For Safety, Sureness of Operation and Durability**

## FOSTER PRESSURE REGULATORS FOR STEAM HEATING SERVICE

**(Classes "Q" and "Q H")**



lead the way. Designed especially for steam heating, and suitable for vacuum systems, for delivery pressure of from 1 to 15 lbs.

We make several types of pressure regulators—those shown in the illustrations here were designed particularly for steam heating service, and they are very sensitive, reliable, high grade in every particular and superior to other makes in construction and workmanship. There are no weights or close fitting pistons, and are easily adjusted to the desired pressure between 1 and 15 lbs. Made in sizes ¾ inch to 2 inches inclusive, composition body. Larger sizes are fitted with composition renewable seats.

Class "Q" Class "Q H"

**FOSTER ENGINEERING CO., Newark, N. J.**

**CHICAGO, ILL., 180 North Dearborn Street**
**PITTSBURG, PA., 518 Park Building**
**PHILADELPHIA, PA., 601 Harrison Building**
**BOSTON, MASS., 161 Summer Street**

These Valves are fully explained on Pages 29 to 33 of our 1913 Catalogue, No. 20.
Please mail copy of Catalogue to

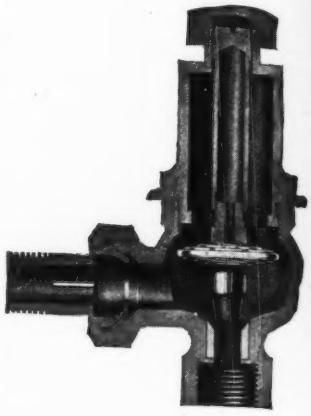
*Name* ..... *Address* .....

# The MARSH REFLUX

## RETURN LINE VALVE

**For Low Pressure, Vapor and Vacuum Heating Systems**

**GUARANTEED FOR FIVE YEARS**



**Will Not Leak Steam**
**Most Economical Valve In Use**
**Sealed Adjustment**
**Absolutely Noiseless**
**Shop Adjusted**
**Easiest to Install**

**Freely Discharges Air and Water**
**WITHOUT LOSS OF STEAM**

THE Marsh REFLUX Return Line Valve is for use on the return end of radiators of low pressure, vapor and vacuum systems of heating. It is the result of a careful investigation into the actual requirements that must be fulfilled by a radiator return valve, in order that it may accomplish what is desired of it, namely, **to free the radiator of air and water without the loss of steam** and to do so **noiselessly.**

**Write for literature fully describing this valve**

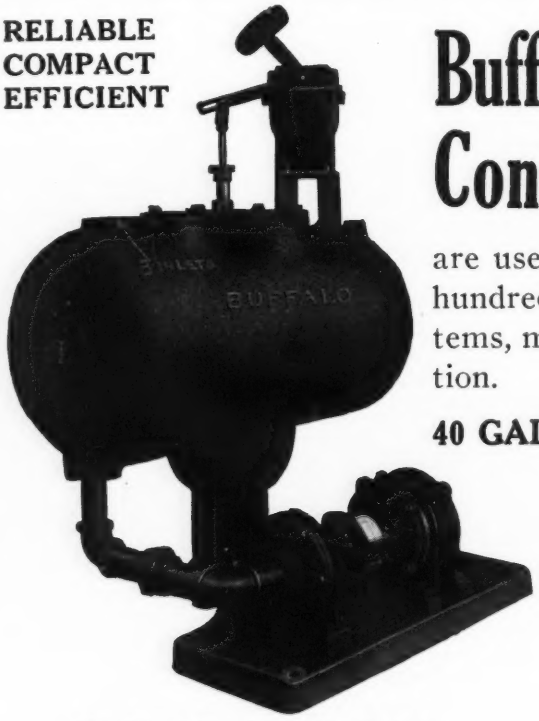
## JAS. P. MARSH & CO.

**Established 1865**

122 South Clinton Street, CHICAGO

**Manufacturers of Gauges for all Pressures and Purposes.**
**Automatic Air Valves and Steam Specialties.**

**RELIABLE**
**COMPACT**
**EFFICIENT**




**No Steel Tank to Rust Out**

# Buffalo Automatic Condensation Pumps

are used to handle returns to boilers in hundreds of low pressure heating systems, materially reducing fuel consumption.

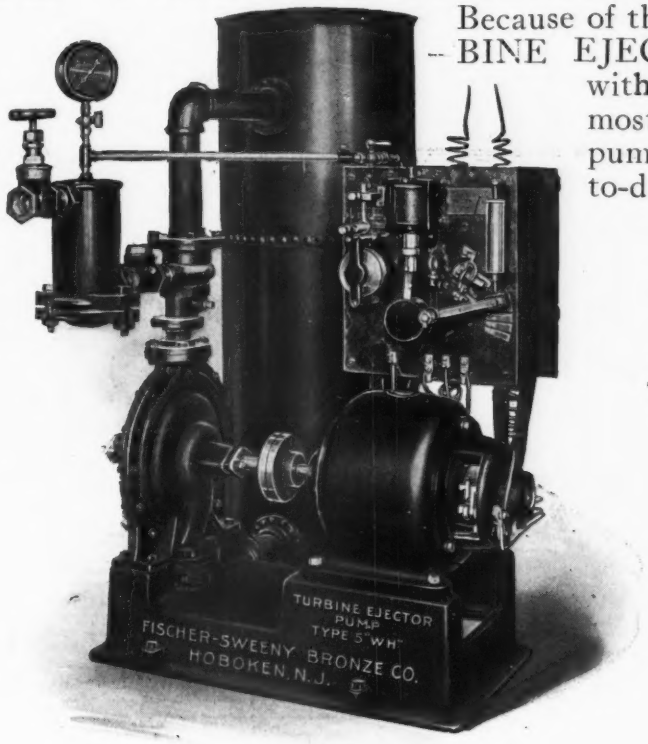
**40 GALLON CAST IRON RECEIVER**
**BRASS FITTED PUMP**

Specify amount of condensation, boiler pressure and details of electric current in your inquiry.

## Buffalo Steam Pump Co.

**Buffalo, N. Y.**

# You Can't Wear Water Out




0 to 100 lbs.

Because of this fact the TURBINE EJECTOR PUMP is without doubt the most durable vacuum pump on the market to-day.

Water, one might say, is the piston. The vacuum is created by the jet principle of producing vacuum. This is accomplished by the centrifugal pump circulating water from the tank through the concentric turbine ejector head at high velocity, which extracts a proportionally large volume of air or condensation from the heating system.

**CONSIDER,** that the efficiency of this pump does not depend upon moving metal parts in close proximity which are constantly liable to damage, due to the presence of grit and dirt, which is very plentiful in a heating system;
That there is but one moving part—the impellor;
That it will dispose of air or water equally well;
That the failure of a janitor or engineer to give due attention to oiling, will cause no harm, as this pump is essentially water lubricated.
That it cannot rust to a detrimental degree between seasons, as the centrifugal impellor is of bronze;
That it is the most silent, electrically operated pump on the market;
That it is absolutely automatic in operation;
That being directly driven the full power generated is applied;
That it is extremely compact, all parts but the tank are mounted on a cast iron base;
That the automatic vacuum regulator is the best that can be procured;
That it is unconditionally guaranteed to perform satisfactorily the duties for which it is specified.
A careful consideration of these facts should well warrant the TURBINE EJECTOR PUMP a place in your specifications.

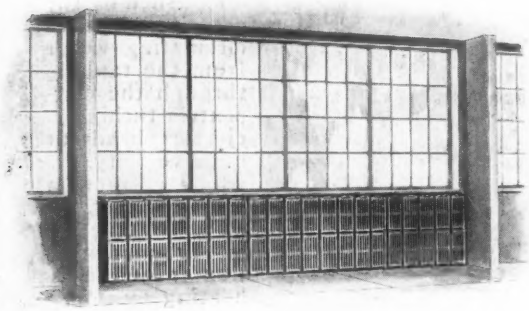
***Let Us Tell You More About It***

## Fischer-Sweeny Bronze Company

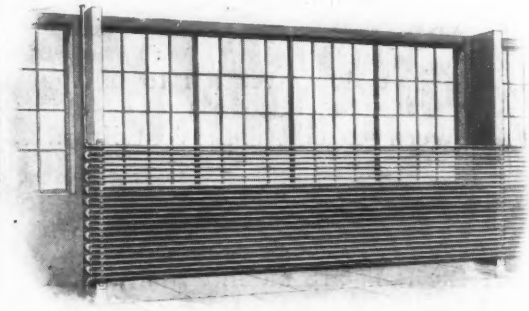
**HOBOKEN, N. J.**

# Space- and dollar-saving Radiators

"A penny saved is a penny earned" is as true today as it ever was. In many buildings, factories and warehouses in particular, floor space has a dollar value. Floor space saved means more working room, more storage room, greater interest on the building investment, bigger dividends. Moreover, in these days of modern factory construction where so much glass surface is devoted to the admission of light and air, wall space is also valuable.



These AMERICAN Rococo Wall Radiators in two tiers contain 360 square feet of heating surface; distance between pilasters, 26 feet; height from floor to window-sill, 5 feet. Radiators do not project above the window-sill.



This Pipe-coil made up of 2-inch pipe, twenty-four pipes high, contains 390 square feet of heating surface; distance between pilasters 26 feet, height from floor to window-sill 5 feet. Pipe-coil projects 2½ feet above the sill.

## AMERICAN Rococo Wall Radiators

save *both* floor and wall space. They are made in sizes and styles which permit of their erection to meet almost any structural requirements, — providing ample heating surface without sacrifice of valuable floor or wall areas. An interesting comparison is illustrated herewith. When it is understood that repeated tests have shown that the condensation per square foot of these radiators is the same as pipe coils the force of this comparison will be readily appreciated by Engineers, Heating Contractors and Architects who closely analyze these important points. They are convincing in themselves, aside from other features of circulation, durability, attractiveness etc., so long established in favor of cast-iron radiation. Ask for complete illustrated catalogue, free.

**AMERICAN RADIATOR COMPANY**

Chicago, New York, Boston, Providence, Philadelphia, Baltimore, Buffalo, Rochester, Washington, Pittsburgh, Cleveland, Cincinnati, Detroit, Atlanta, Birmingham, New Orleans, Indianapolis, Milwaukee, Omaha, Minneapolis, St. Paul, St. Louis, Kansas City, Denver, San Francisco, Los Angeles, Portland, Seattle, Spokane, Brantford, (Ont.), London, Brussels, Paris, Berlin, Cologne, Vienna, Milan